OCTOBER, 1953 — SIXTIETH YEAR

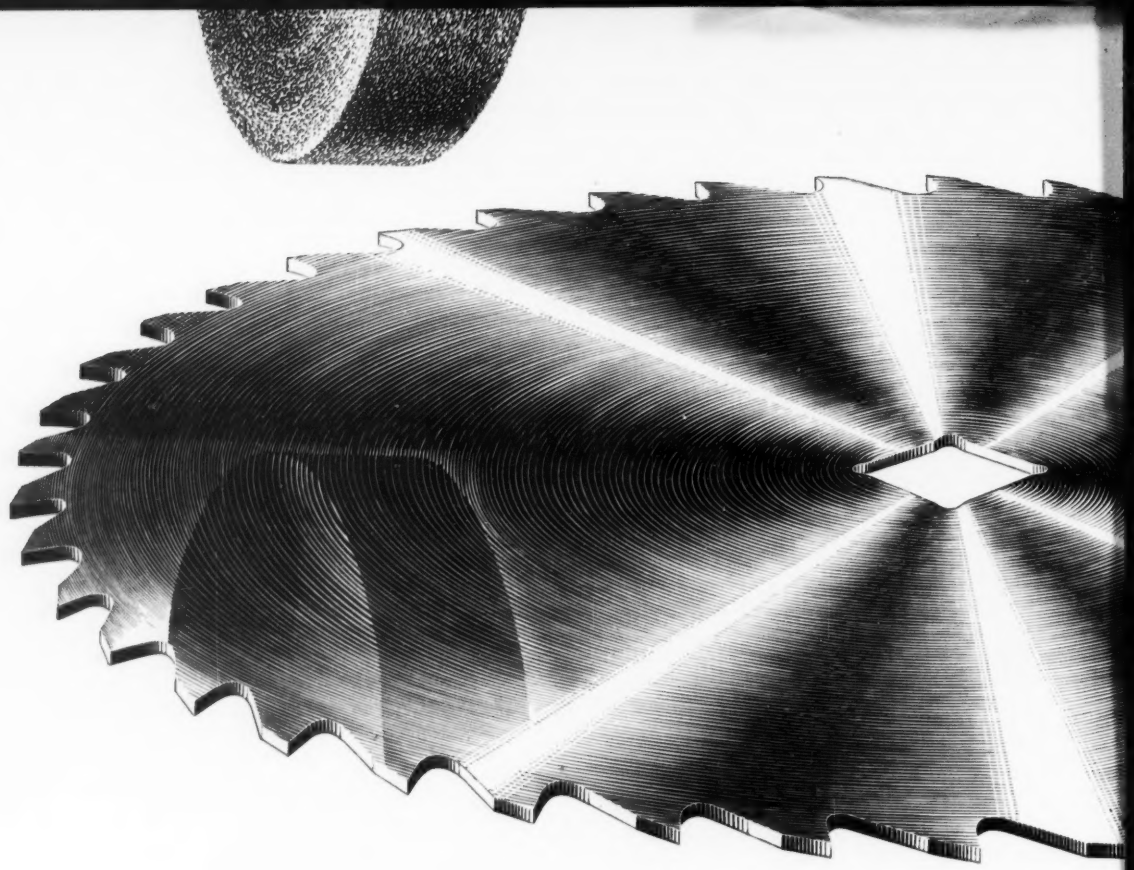
MACHINERY



M-R-C has long been known for leadership in the field of Super-Precision Ball Bearings. With the opening of our new factory in Falconer, N. Y., we are now manufacturing Instrument Bearings of Super-Precision Quality.

MARLIN-ROCKWELL CORPORATION, Executive Offices: Jamestown, N. Y.

Factories:
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Falconer, N.Y.
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Saw blades ground

190% FASTER



Grinding the surface of a circular saw blade isn't a complicated operation, to be sure. But accuracy and precision are mighty important to the success of the end product. And minutes saved per part add up to an important reduction in manufacturing cost.

Here's a case where a Heald Model 261 Rotary Surface Grinder did the job 190% faster than by previous methods. The grinding operation is performed automatically, with maximum speed and precision, at the push of a button. Swiveling of the chuck produces a .005″ taper toward the center of the blade. And loading is simply a matter of placing the blade over a center locating pin in the 12″ magnetic gap chuck, with a drive pin between teeth as an extra safeguard against slippage under heavy cuts.

Remember—when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

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MACHINERY

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The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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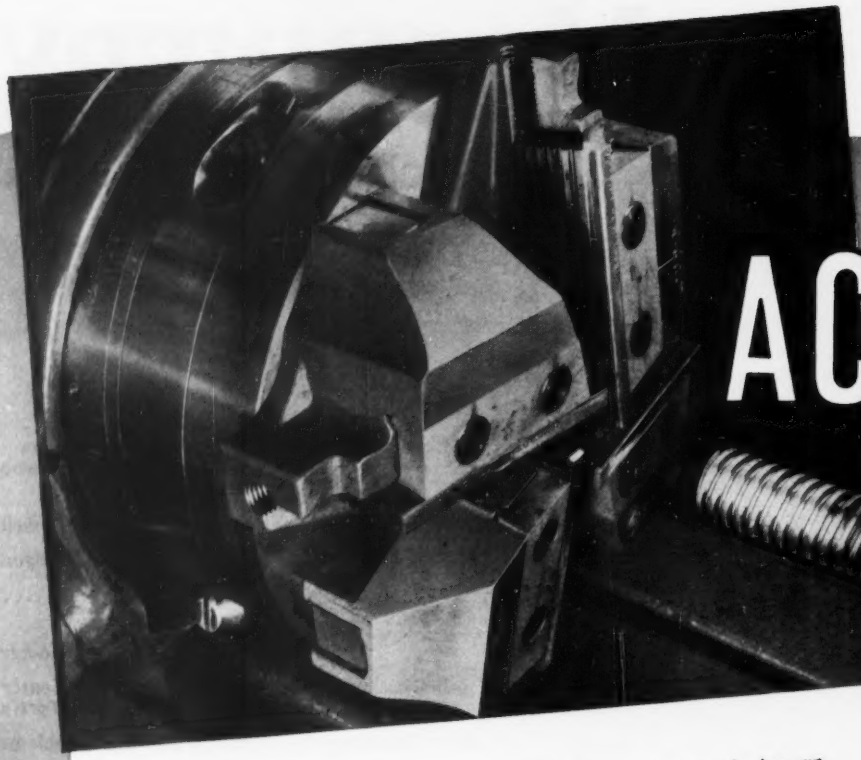
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ACME Better



A LANDMACO Threading Machine is today playing an important part in the production of top-quality stainless steel valves at The Cooper Alloy Foundry Co. in Hillside, New Jersey.

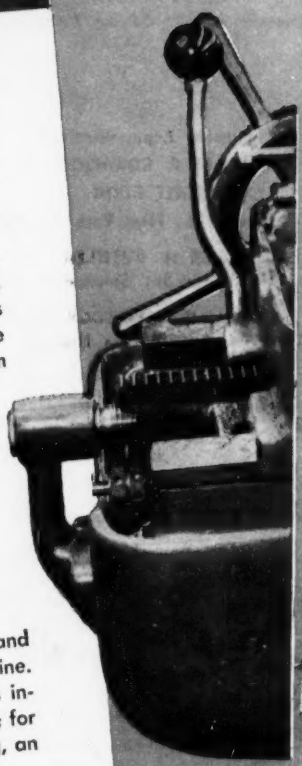
One operation, illustrated here, involves cutting ¼" pitch ½" lead Acme threads on 1⅝" diameter 304, 316, and 347 stainless steel valve stems. Both thread finish and concentricity are improved over previous threading methods, important factors in meeting the rigid quality standards for "certified" Cooper Alloy valves. IN ADDITION, large production savings are being realized. Each valve stem is threaded with a full 15⅞" thread in 2.5 minutes floor-to-floor time—as against 204 minutes by the previous method. Large savings are also being made in set-up time and in tool cost.

This operation is performed by a 2½" LANDMACO Leadscrew Machine equipped with a 2½" R LANCO Head using roughing and finishing chasers with centering throats. These chasers eliminate the out-of-round condition so common in long workpieces and produce coarse pitch threads of excellent finish in one pass.

Other valve stems, requiring left-hand, right-hand, double-start, and single-start threads, are also produced on this same LANDMACO Machine. These threads range from ⅜" to 1⅝" in diameter, and thread forms include both Acme and U.N. Tool cost is low in all of these operations; for example, when producing a ¾" 6 pitch single Acme thread 5⅛" long, an average of 500 pieces was threaded between chaser grinds.

This case history in just one plant illustrates the possibilities of the LANDMACO Threading Machine in Thread Production—a better quality thread, a lower thread cost, a greater versatility of production. Are there Threading Operations in your plant where these benefits might be realized?

Write for Bulletin H-75.

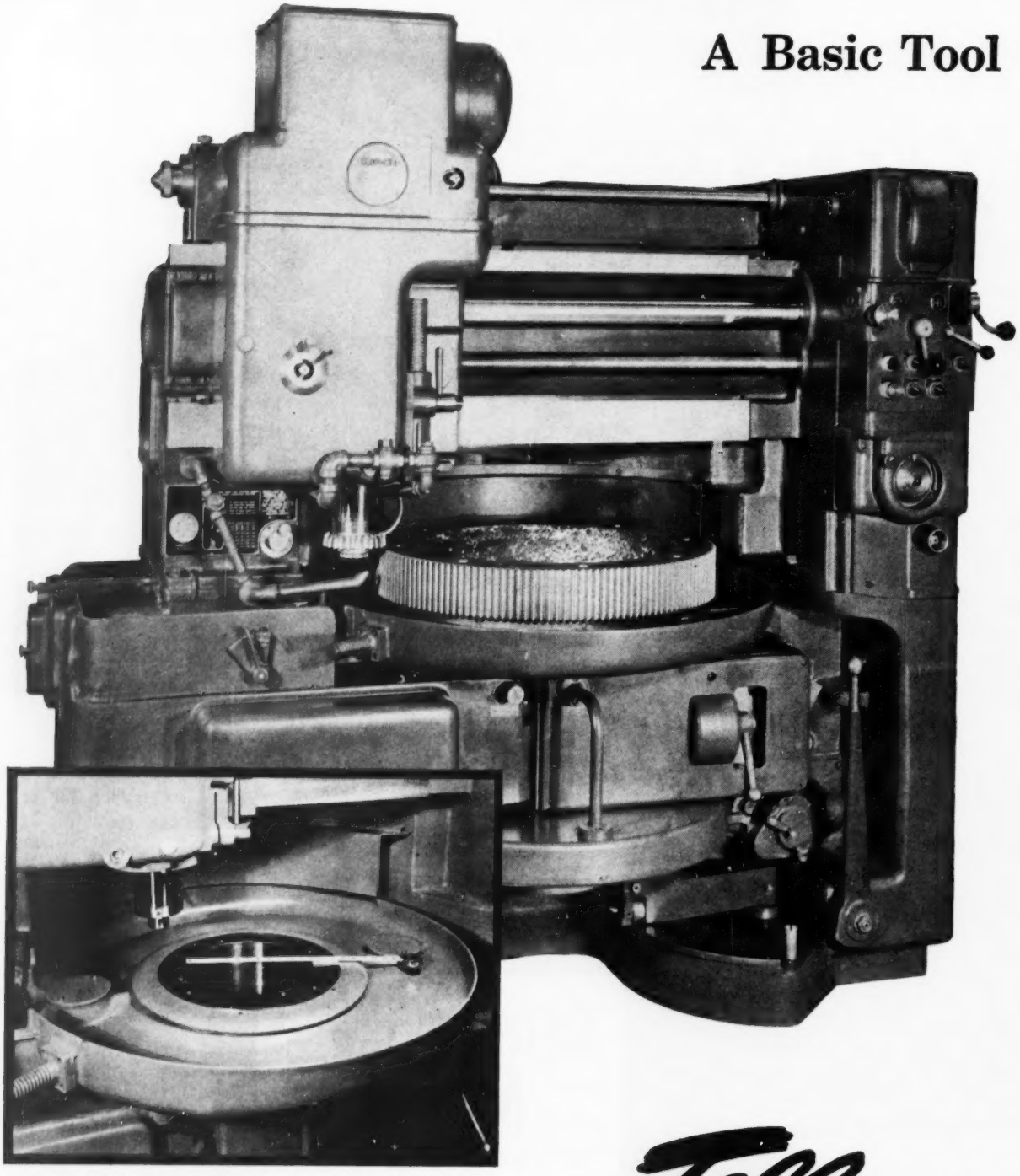


WORLD'S LARGEST



(For more information on products advertised, use Inquiry Card page 245)

A Basic Tool



Great flexibility in work handling is possible with the new 36Z-1 Type Gear Shaper. Note the 12″ diameter straight hole in the work-spindle.

Fellows

The FELLOWS METHOD ...in action!

for

HEAVY-DUTY Gear Cutting

- *Standard 36-Type* Fellows Gear Shaper for spur or helical gears to 6" face width in all sizes up to 36" pitch diameter—external or internal. Herringbone gears, cams, ratchet teeth, splines, special contours . . . all rough and finish cut on one set-up.

- *36Z-1 Type* (with 12" hole in work spindle) for cutting large shank gears, aircraft crankshaft splines, variable pitch propeller blade hub splines, etc.



Cutting coarse pitch pinion on 36Z-1 Type Gear Shaper at the Illinois Gear & Machine Company, Chicago, Illinois.

Designed for high-production with maximum flexibility, the 36-Type Gear Shaper is the all-purpose machine for production or jobbing shop gear-cutting. Set-up time is low. Operation is easy . . . quick change-over from heavy-feed roughing to fine-feed finishing cuts by shifting a lever. Choice of 12 cutter-spindle speeds, quickly shifted through a selecting dial. Machine rigidity and power make it possible to hold close limits while taking heavy cuts. The versatile 36-Type can lower your gear production costs. Write the nearest Fellows Office for details.

GEAR SHAPER COMPANY

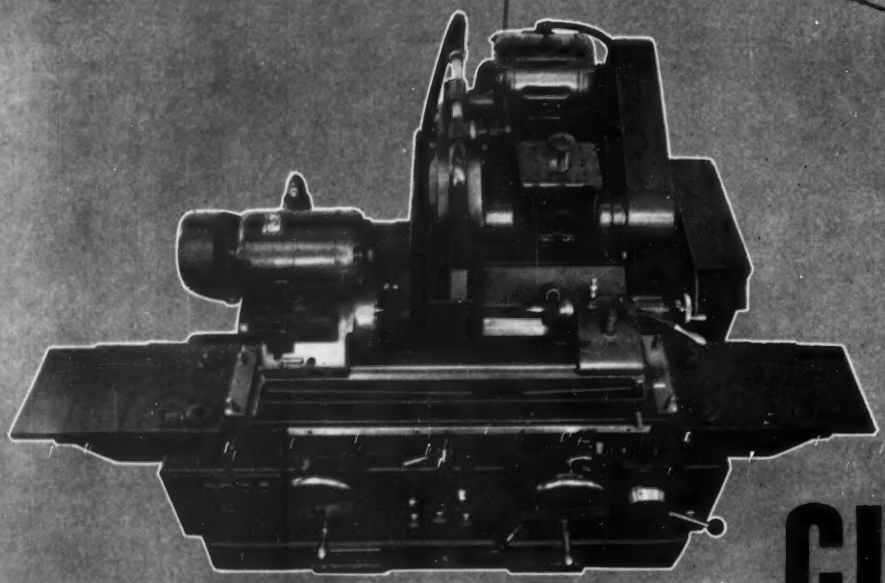
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Branch Offices: 323 Fisher Building, Detroit 2 • 5835 West North Ave., Chicago 39.
2206 Empire State Building, New York 1.

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Any Way You Look at it ...

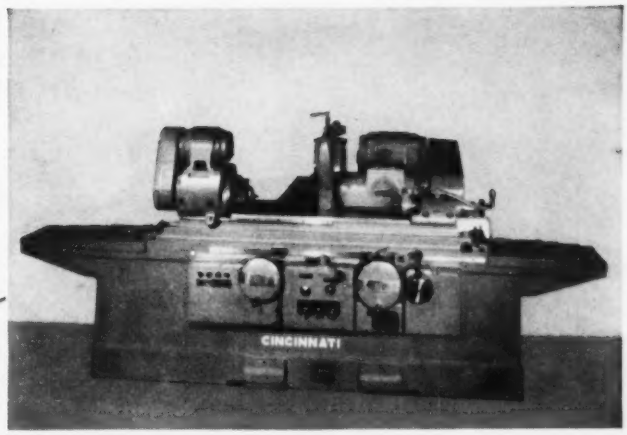
MANAGEMENT PREFERS

CINCINNATI FILMATIC PLAIN HYDRAULIC GRINDERS



CINCIN

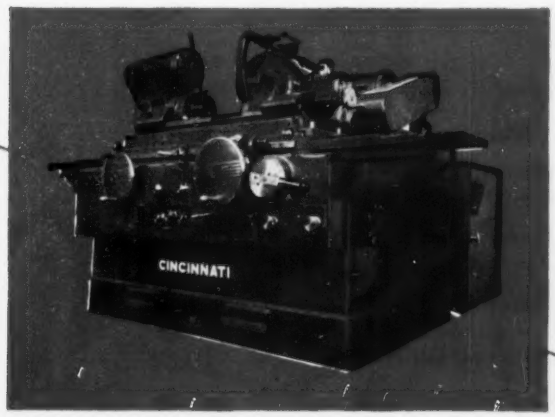


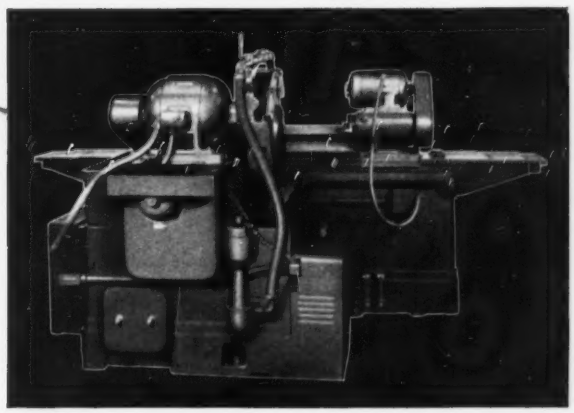


A look at the "balance sheet" for recent installations quickly shows why management men prefer CINCINNATI for their Plain Grinder equipment. Briefly, these machines make money for their owners. How? Well, in the first place consider their reliability. Shopmen will confirm the statement that the grinding wheel spindle bearings are a big influence in the reliability of a precision grinder. In CINCINNATIS, they're FILMATICS; they run for years without quitting. And the overall maintenance picture for these machines is very bright. A number of features such as automatic filtered lubrication of ways, unit construction, and others reduce maintenance to a negligible percentage of cost. These machines withstand severe operating conditions, too. Production control and time study men know how important is this qualification, for they can count on rapid stock removal to extra fine finishes and accurate sizing. Extra features are available for high production runs. And when it comes to actual operation, ask the man who runs one. He will tell you that CINCINNATI FILMATIC Plain Hydraulic Grinders are easiest of all to operate and their accuracy of sizing is very reliable. ¶ Any way you look at it, from the viewpoint of management or the men whose judgment management must trust, you will find that CINCINNATI FILMATIC Plain Hydraulic Grinders are the best buy for your shop. We should like to tell you more about these fine precision grinding machines.

Telephone our nearest direct office—Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, Pittsburgh or Syracuse. Sales representatives are located in other manufacturing centers. Ask for catalog No. G-566-2 covering the 6" and 10"-L sizes; or catalog No. G-603 covering the 10" and 14"-L sizes. Brief data in Sweet's Machine Tool Catalog.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO





NATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

(For more information on products advertised, use Inquiry Card page 245)

New

VAN NORMAN 418

CYLINDRICAL GRINDER

Completely Engineered

to Give Heavy Machine Performance

New Design Permits Economical Close-Tolerance Short Run or Production Grinding of Small Parts

Here's the new Van Norman 418 Cylindrical Grinder that is cutting costs in grinding of small parts.

Especially developed for fast plunge or traverse grinding, it is particularly adaptable for toolrooms, job shops, or plants where work is usually in small or medium runs.

Compare these important Van Norman features...

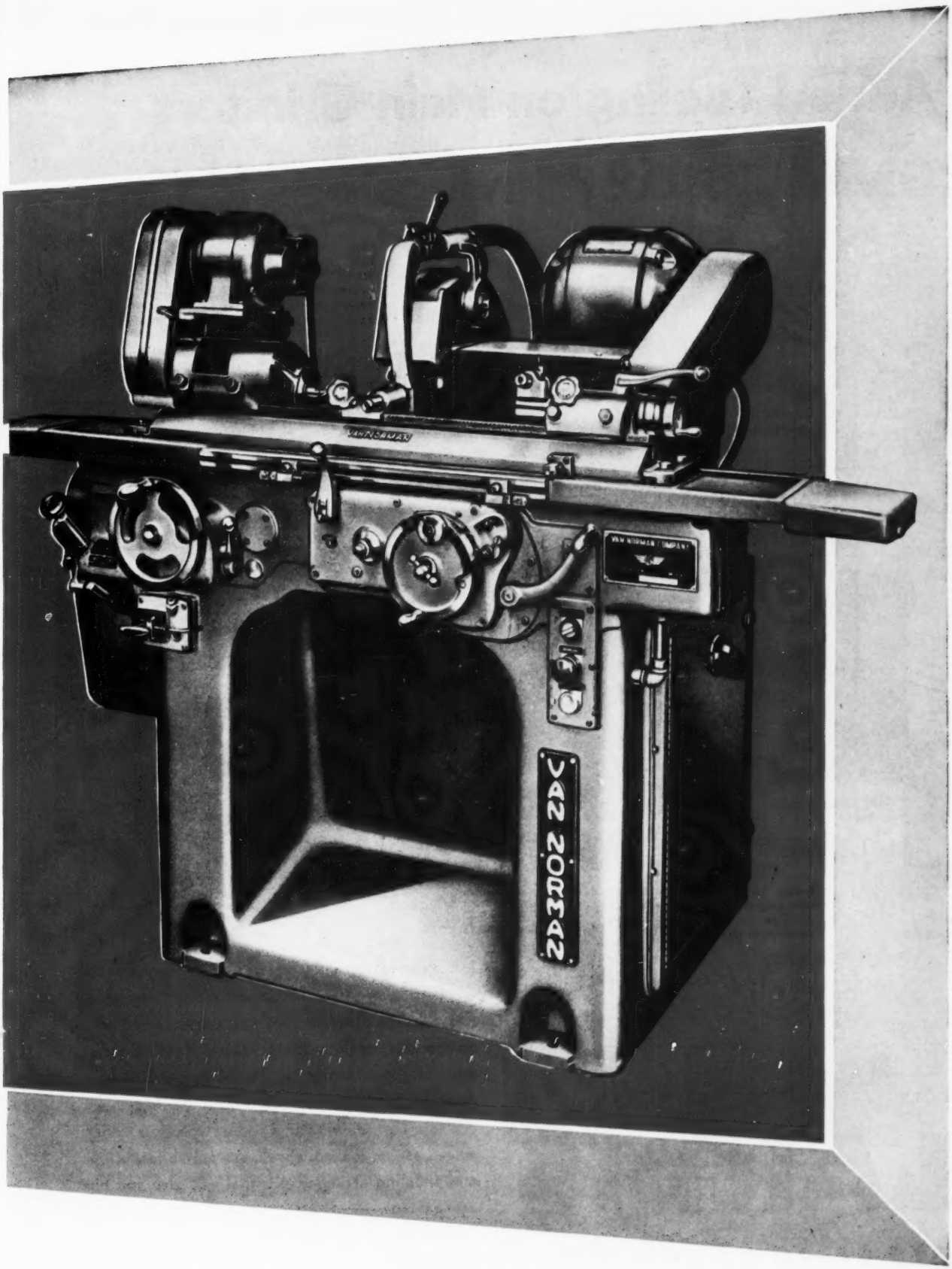
- Pope wheel spindle engineered with extra-large SKF double row cylindrical roller bearings assures smooth, chatter-free finish and long operating life.
- Heavy-duty headstock and footstock for rigidity, accuracy and smooth grinding.
- Floor space needed, only 43½" x 79¼".
- Single lever control for rapid plunge and traverse grinding.
- Automatic starting and stopping of headstock and table traverse.
- Controls are conveniently grouped in front of grinder for ease of operation and maximum operator efficiency.

Find out for yourself how the Van Norman 418 Cylindrical Grinder reduces over-all work completion time . . . cuts costs of grinding small parts. Write for Catalog, today. Especially inquire about the price . . . it's exceptionally low for a quality grinder.

VAN NORMAN COMPANY

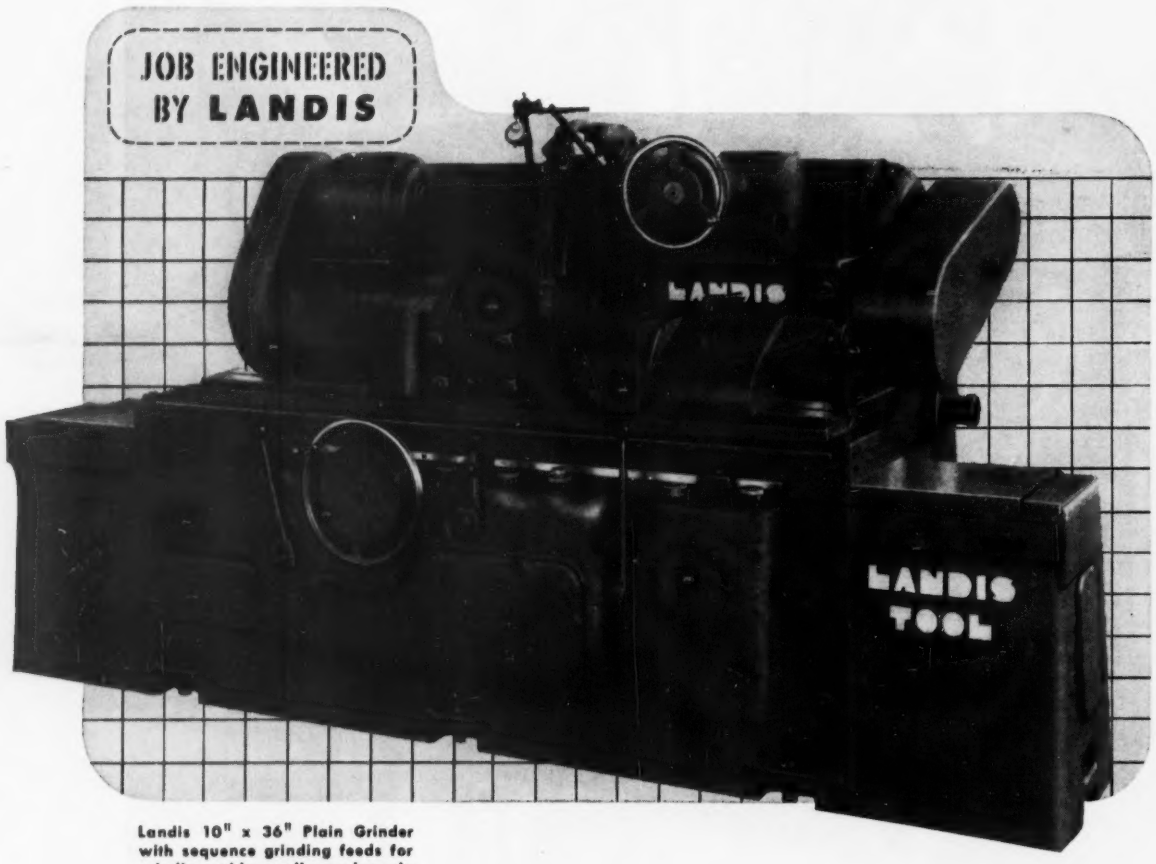
SPRINGFIELD 7, MASSACHUSETTS

Manufacturers of Precision Grinders Since 1912


VAN NORMAN

How LANDIS JOB ENGINEERING Cuts Grinding Costs . . .

Added Tooling on Plain Grinders Gives BIG Cost Savings



Landis 10" x 36" Plain Grinder with sequence grinding feeds for grinding side walls and main bearings of crankshafts.

Job engineering by Landis starts with operator convenience, hydraulic controls and simplified maintenance of a standard Landis grinder. Then, on the basis of your requirements of finish, tolerance and production, additional tooling may be recommended to give you best results at the lowest possible cost. Automatic grinding cycles, angular wheelbase or spaced wheels are only a few of the many tooling arrangements that will give you big cost savings.

Send us your prints for tooling and production estimates. No obligation.

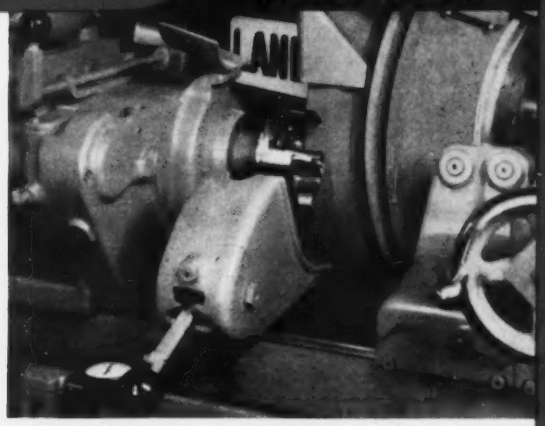
LANDIS[140]

precision grinders

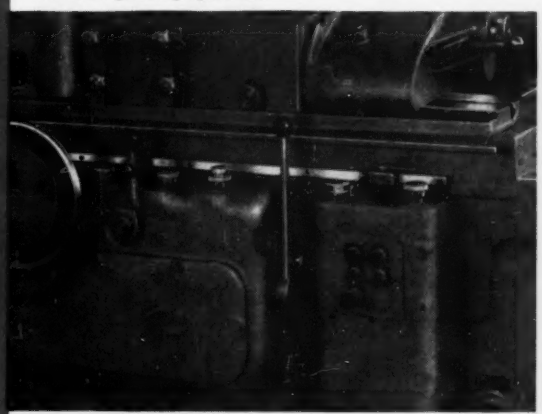
JOB ENGINEERED BY **LANDIS**



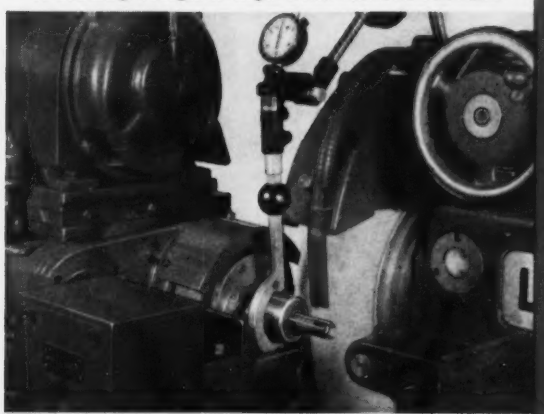
SHOULDER GRINDING for short runs of pieces which require accurate grinding of shoulders in combination with the O.D. grinding operation.



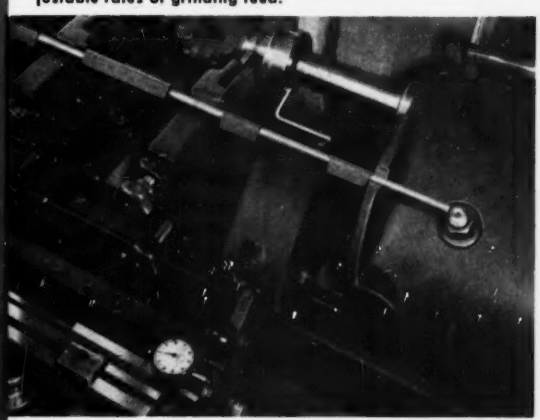
LIVE SPINDLE HEADSTOCK permits efficient O.D. grinding of diameters and faces of parts which are best suited to chucking. Straight or angle wheel heads can be used.



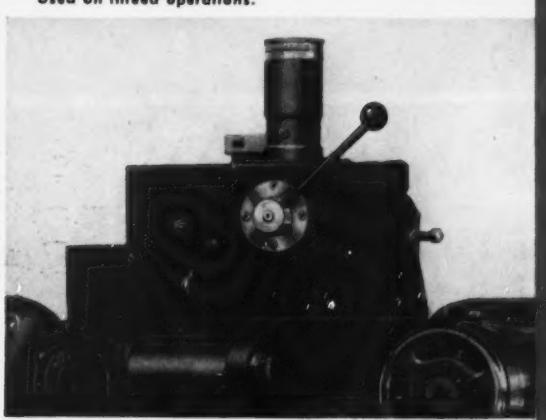
SEQUENCE RATE FEEDS for pieces which have combined sidewall and O.D. grinding. Gives separately adjustable rates of grinding feed.



AUTOMATIC SIZING reduces need for operator skill by stopping grinding feed when finished size is reached. Used on infeed operations.



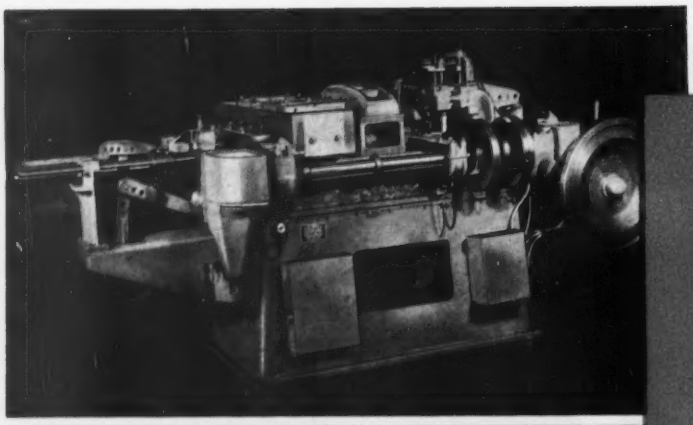
LATERAL LOCATING aligns work piece and wheel quickly and accurately. Eliminates possibility of work and wheel interference during rapid approach of wheel head.



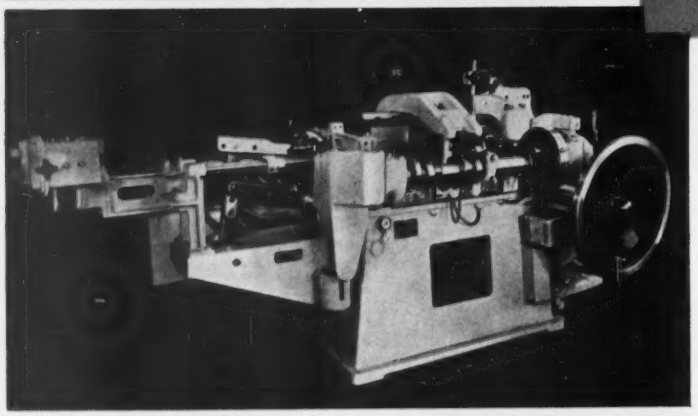
PROFILE DRESSERS in a wide variety of types. Designed for precision dressing of shapes and radii on grinding wheels. Can save you time and eliminate extra operations.

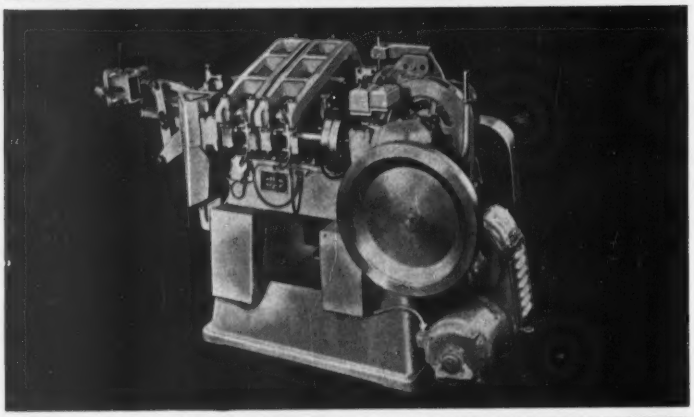
LANDIS TOOL COMPANY • WAYNESBORO, PENNSYLVANIA, U. S. A.

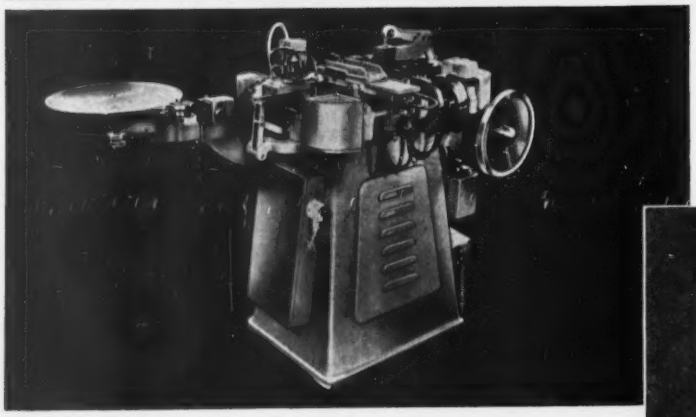
(For more information on products advertised, use Inquiry Card page 245)











TOP TO BOTTOM

No. 35 U. S. MULTI-SLIDE

Maximum width of stock that can be handled, 3". Feed length obtainable, 12 1/2". Overall size of Machine, 57" high by 55" wide by 147" long. Net weight, 9560 pounds. Motor, 7 1/2 HP.

No. 33 U. S. MULTI-SLIDE

Maximum width of stock that can be handled, 2 1/2". Feed length obtainable, 12 1/2". Overall size of Machine, 54" high by 49" wide by 120" long. Net weight, 5900 pounds. Motor, 5 HP.

No. 28 U. S. MULTI-SLIDE

Maximum width of stock that can be handled, 1 1/2". Feed length obtainable, 8". Overall size of Machine, 50" high by 38" wide by 80" long. Net weight, 2600 pounds. Motor, 2 HP.

No. 11 U. S. MULTI-SLIDE

Maximum width of stock that can be handled, 3/4". Feed length obtainable, 3". Overall size of Machine, 44" high by 40" wide by 66" long. Net weight, 1090 pounds. Motor, 1 1/2" HP.

These four machines are described in detail in Bulletin 15-M. Write for your copy.

PRODUCTS

U.S. TOOL

Precision Formed Stampings Produced Complete with U. S. MULTI-SLIDES®





The formed stampings illustrated above are just a few of the many different types and sizes of parts that can be produced rapidly, accurately and efficiently in U. S. Multi-Slides.® There are four standard models of U. S. Multi-Slide Machines for producing parts ranging in size up to 3″ in width. Specifications of these machines are given at the left.

Produce Parts Complete — Reduce Costs — Increase Production

One of the outstanding features of these machines is their ability to produce, complete at each stroke, parts which would ordinarily requi e secondary operations and handlings if produced on conventional presses. Because formed stampings are produced uniformly and to close tolerances with U. S. Multi-Slides, quality is improved and yet the number of necessary inspections is reduced.

Get Greater Versatility

The various movements obtainable on U. S. Multi-Slides are provided by units which are part of the machine equipment, and do not have to be built into the tools. Tools for any one size of U. S. Multi-Slide can be used with any other U. S. Multi-Slide of the same size.

If your production involves piercing, trimming, embossing, swaging, stamping, forming and similar operations, write for a copy of Bulletin 15-M, which gives complete specifications of all four U. S. Multi-Slides.

® Trade Mark Registered, U. S. Patent Office

COMPANY, Inc. AMPERE (East Orange) NEW JERSEY

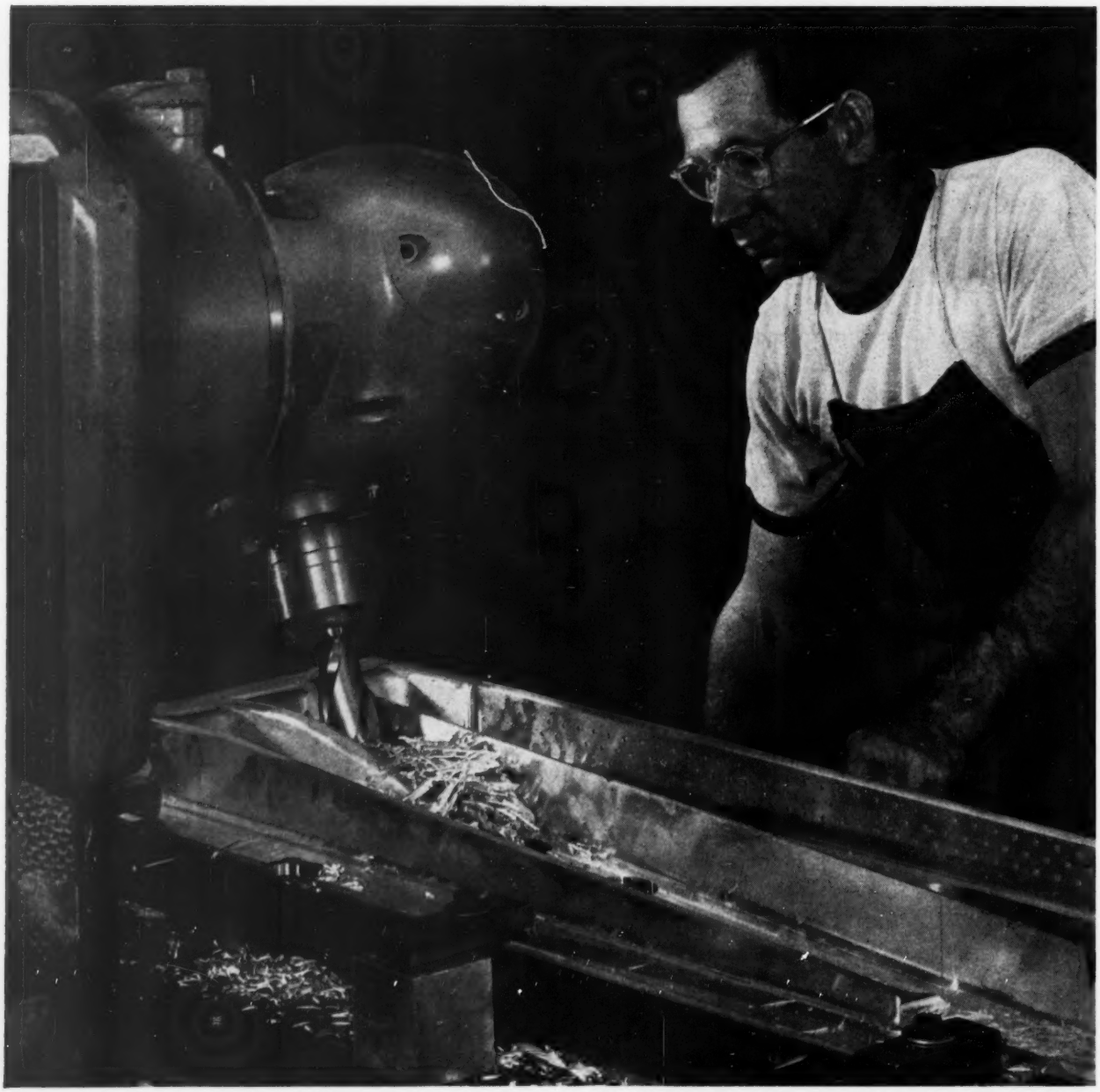
Builders of U S Multi-Slides–U S Multi-Millers

U S Automatic Press Room Equipment–U S Die Sets and Accessories

(For more information on products advertised, use Inquiry Card page 245)

KEARNEY & TRECKER MILWAUKEE

CK MILLING MACHINE OF STANDARD



THE FACTS ON THIS JOB ARE: Machine: No. 6 — Model CK Plain (25hp) with heavy-duty universal Milling Attachment. Part: Large fusilage spar fitting — overall dimensions 39 5/16" x 17 3/8". Material: Aluminum Alloy 75ST (forging). Tool: 2-inch, 2-lip end-mill. (HSS). Speed: 265 rpm. Feed: 3 1/8 ipm.

Here's a typical example of how relatively inexpensive tooling greatly increases the versatility of Kearney & Trecker's new CK milling machines . . . producing a completed part every 6 minutes. Two operations were required for each part — (one) milling out the holes and recessing on the edges, then after changing the attachment setting and cutter — (two) finishing the inside (see photo).

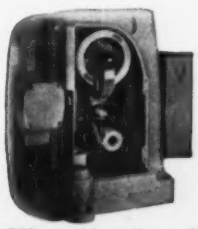
SPEEDS OUTPUT PRODUCTION PARTS

TEN ALUMINUM ALLOY 75ST (FORGING) AIRCRAFT SPARS PRODUCED EVERY HOUR FOR MAR VISTA ENGINEERING CO.

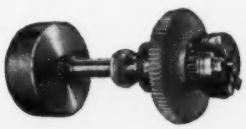
CK MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER



Greater rigidity of new CK column easily absorbs vibration from heaviest cutting loads. Only single pass needed for each part.



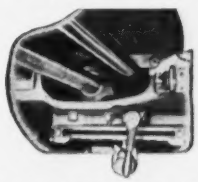
New CK machines have Greater Horsepower. On this job, 25 hp permitted operator to get maximum work from his modern cutter.



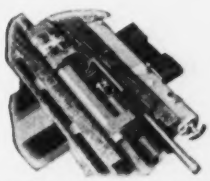
CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.



The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from ⅜" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.



CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed and sustained accuracy.



CK's positive lubrication plus generously proportioned gears and shafts assure cool, trouble-free operation under heaviest loads.

New 25hp No. 6 Model CK Plain



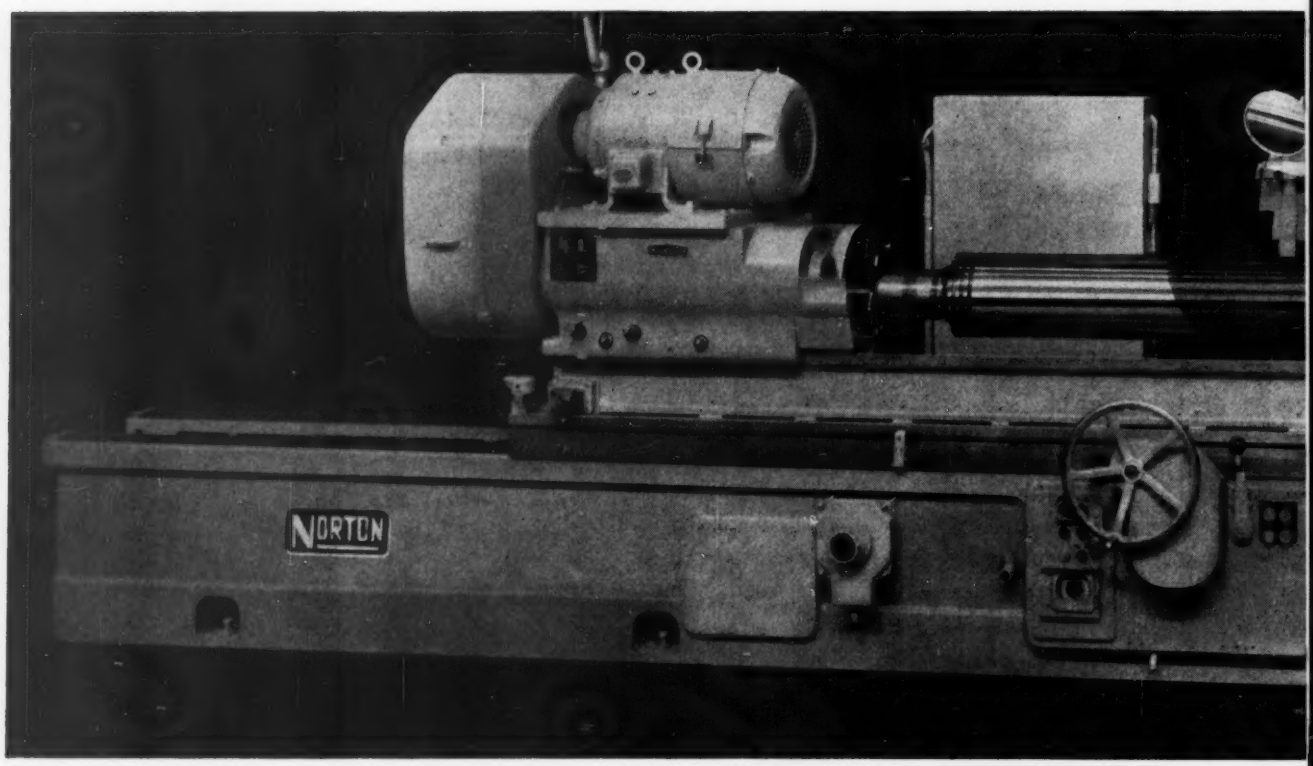
IT will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results — greater capacity, productivity and better finished products. For the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

(For more information on products advertised, use Inquiry Card page 245)

You get bigger profits...the real "TOUCH OF GOLD"

with the new Norton C-2 cylindrical grinder

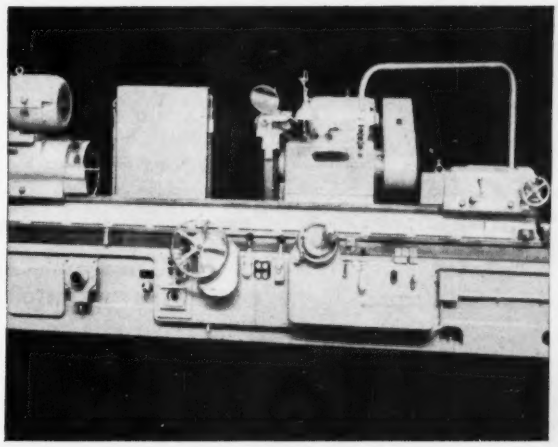


Faster cutting . . . quicker set-up . . . easier operation

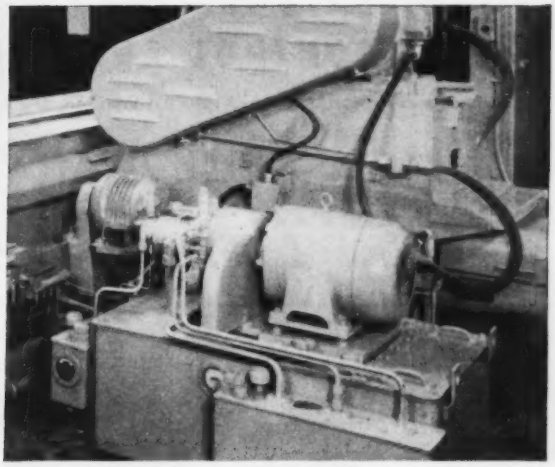
This is the kind of grinding machine you expect from Norton — one that's tops for accuracy, production rate and ease of operation.

The new C-2 gives you more heavy production because it works more of the time — and works faster and easier. When used as a semiautomatic all your operator does is set it up and push the button for automatic grinding to exact size and finish.

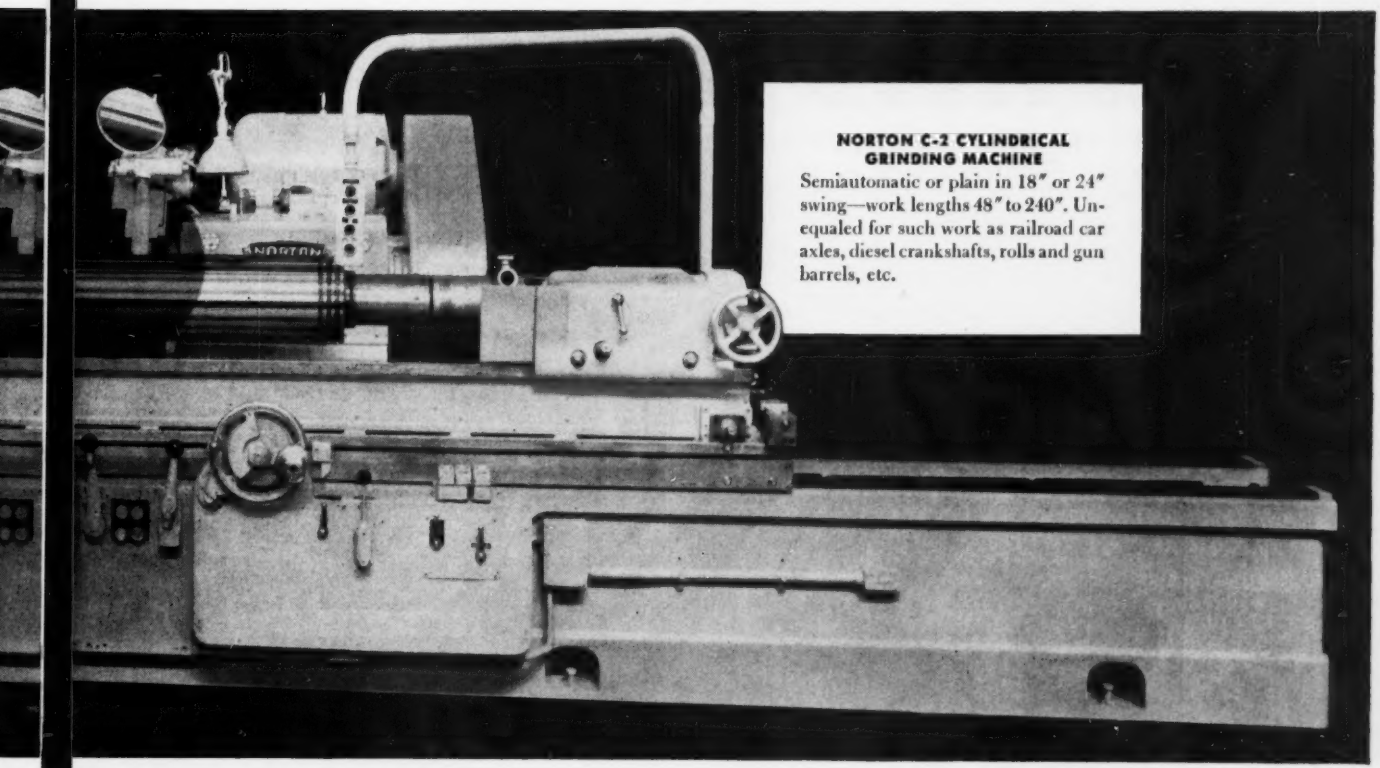
Remember, only Norton offers you such long experience in both grinding wheels and machines — assuring you the



EASY TO SET UP AND OPERATE. All controls in front for minimum set-up time, quick change-over and no reaching by operator. Graduated feed hand wheel indicates feed. "Click-counter" signals each .0001" reduction in work diameter. Table-truing and grinding speeds may be pre-set, and obtained by selector lever.



EASY TO MAINTAIN. All maintenance points on outside. Pumps, motors, filters, lubrication valves and all reservoirs easily accessible. Electrical controls grouped for easy inspection and enclosed for protection.



NORTON C-2 CYLINDRICAL GRINDING MACHINE

Semiautomatic or plain in 18" or 24" swing—work lengths 48" to 240". Unequaled for such work as railroad car axles, diesel crankshafts, rolls and gun barrels, etc.

. . . less down-time

value-adding, "Touch of Gold" that means more and better products for less cost.

Get ALL The Facts. Your Norton Representative will be glad to give you further details on the new C-2, and to discuss your grinding problems or, write direct to NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize Modernize With **NEW**

NORTON

GRINDERS *and* LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

(For more information on products advertised, use Inquiry Card page 245)

Faster cutting . . . quicker set-up . . . easier operation

This is the kind of grinding machine you expect from Norton — one that's tops for accuracy, production rate and ease of operation.

The new C-2 gives you more heavy production because it works more of the time — and works faster and easier. When used as a semiautomatic all your operator does is set it up and push the button for automatic grinding to exact size and finish.

Remember, only Norton offers you such long experience in both grinding wheels and machines — assuring you the

FOUR FEATURES THAT PAY OFF IN SIZE-CONTROL AND LONG LIFE

are designed and built into all WINTER TAPS, resulting in

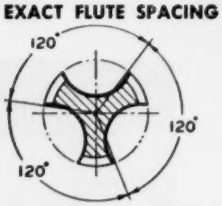
BALANCED Action



WINTER

WINTER BROTHERS COMPANY
Rochester, Michigan, U. S. A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Co.

1 EXACT FLUTE SPACING



It is accomplished by high precision indexing.

2 UNIFORMITY OF FLUTE CONTOURS



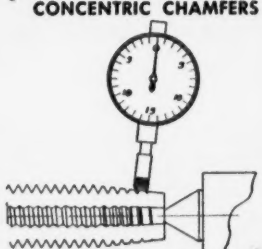
You can't get true Balanced Action without this.

3 PRECISION CHIP DRIVER CONTOURS

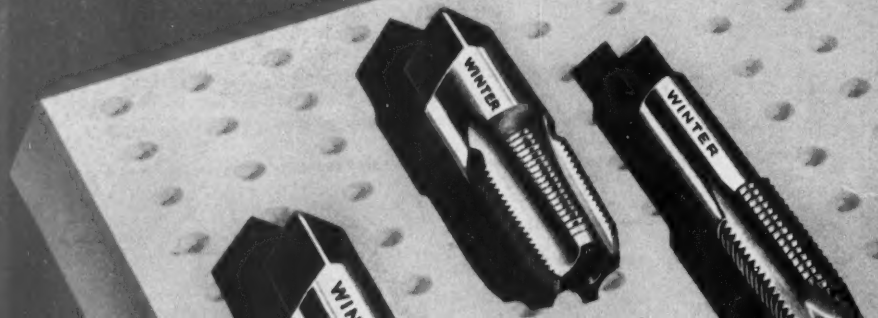


They are exact to size, shape, and position.

4 ACCURATE AND CONCENTRIC CHAMFERS



—with very close limits on shank and thread.



. . . less down-time

value-adding, "Touch of Gold" that means more and better products for less cost.

Get ALL The Facts. Your Norton Representative will be glad to give you further details on the new C-2, and to discuss your grinding problems or, write direct to NORTON COMPANY, Machine Division, Worcester 6, Mass.

(For more information on products advertised, use Inquiry Card page 245)

To Economize Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

WITH HIGH HELIX ANGLES—

WITH *National* CUTTING EDGES

these "Helex" End Mills give long, faithful service. They're "smooth operators"—even when you push them with high speeds and feeds!

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U. S. A. Distributors in principal cities.

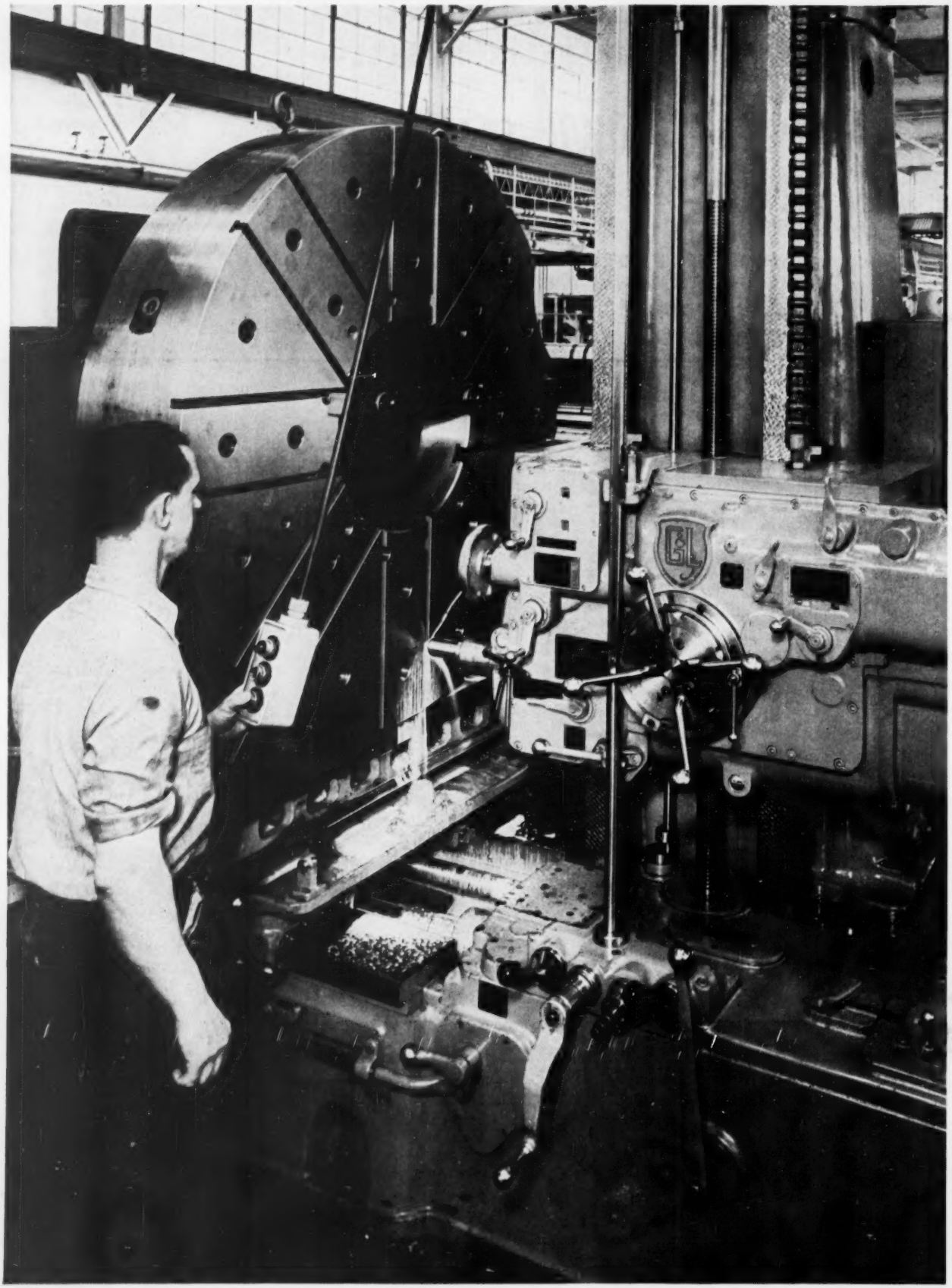
Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco



CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs and special tools.







20-ton aspirin...

to end production headaches!

This versatile machine helps you eliminate problems of overly long floor-to-floor time . . . frequent, complicated setups...and expensive re-runs on close tolerance work. It's the G & L 30-Series table type Horizontal Boring, Drilling and Milling Machine

For either long production runs or custom jobs, G&L 30-Series machines offer you many advantages to speed work, cut costs and increase shop flexibility. They feature an unusually wide range of speed and feed selections, extreme rigidity and accuracy, plus easy, positive control.

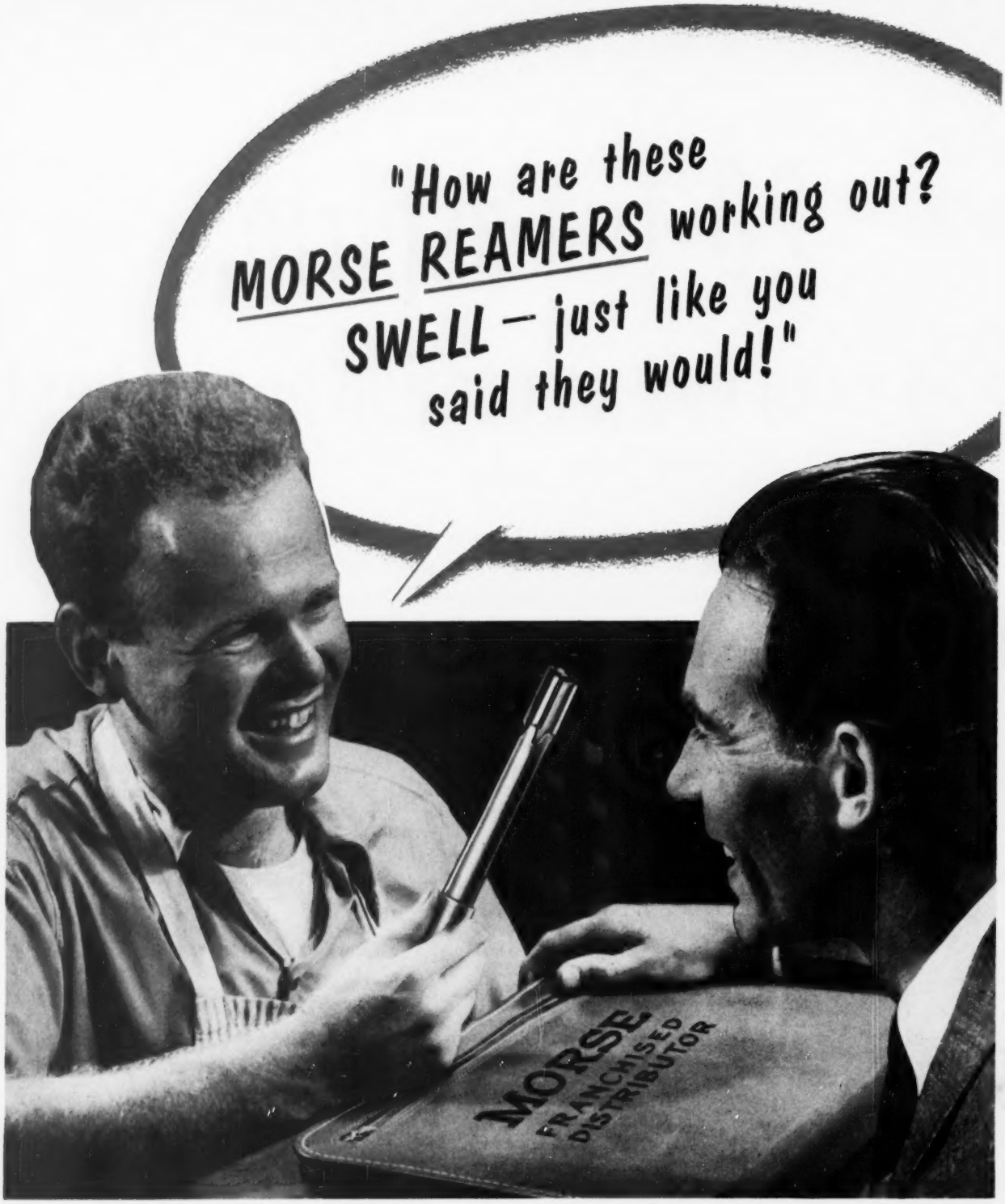
In addition, for special jobs or special problems, they are available with a host of attachments and accessories. Any one piece of optional equipment may help you turn a previously losing proposition into a real profit-maker. This equipment includes: an Automatic Electric Positioning Device, built-in or separate revolving tables, angular milling attachments and continuous feed facing and boring heads.

G&L table type machines are available with 3, 4, 5, 6 and 7 inch diameter spindles. Any model is available in a choice of four basic table and saddle arrangements in various sizes. For complete details on these cost-cutting, work-speeding machines, see your G&L representative or write —

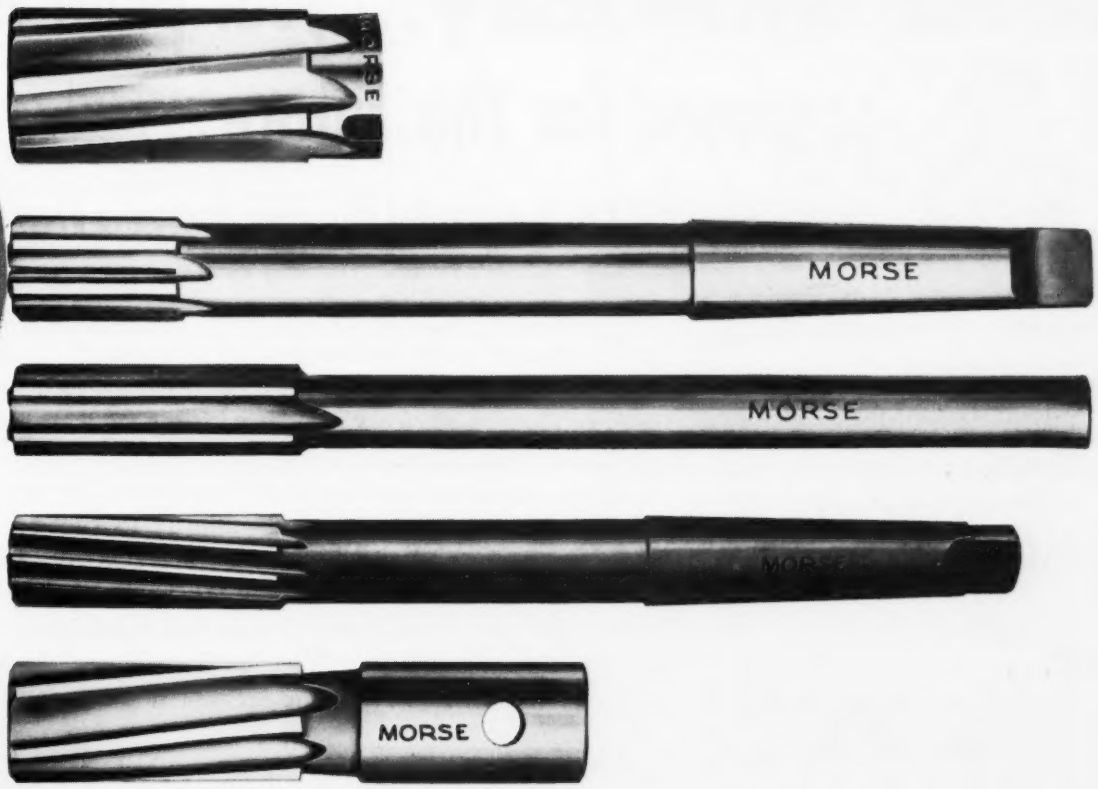
GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools


"How are these
MORSE REAMERS working out?
SWELL — just like you
said they would!"
MORSE
FRANCHISED
DISTRIBUTOR

MORSE



See your Morse-Franchised Distributor about

MORSE REAMERS

for "Top-Hole" performance on every job

Staggered flute-spacing is the payoff feature of Morse Reamers. It ends biting, slipping . . . gives you smooth cutting and *accurate hole-sizing every time.* Chips are cleared freely, with no galling or scoring of the surface.

Morse makes *all* types of Reamers, for ferrous and non-ferrous . . . including the Morse Expanding Chucking Reamer which can be reground again and again . . . and even including the huge tools used in bridge and structural work. What's more, you can get Morse Reamers *Electrolized* for extra life, if you wish.

Talk it over with your Morse-Franchised Distributor . . . he's got the know-how and the stock to start you toward better work and greater savings than you ever expected from this type of cutting tool. *Call him today.* He'll give you your first saving (in time) right now.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

(For more information on products advertised, use Inquiry Card page 245)

Come what may...your plant is prepared for the future...



when it's equipped with versatile LAKE ERIE *hydraulic presses*

Norris-Thermador Corp. provides another excellent example

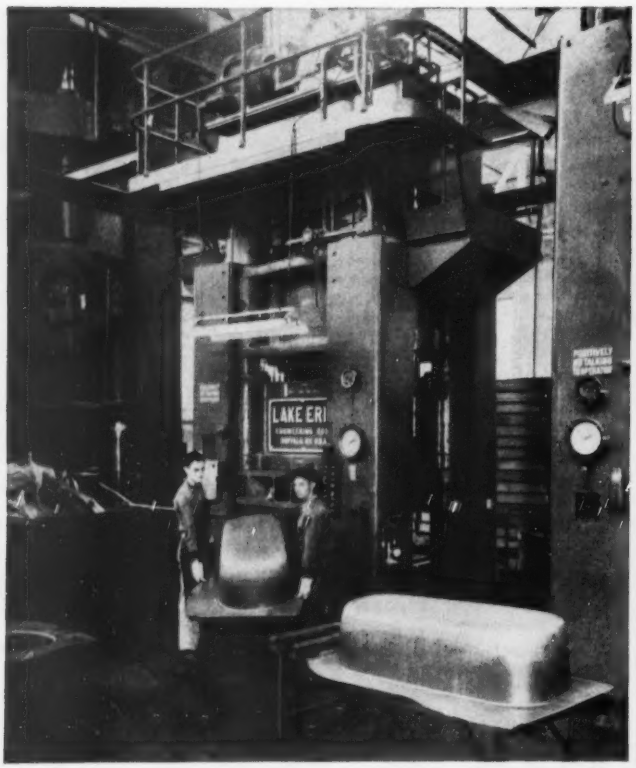
YESTERDAY...
it was bathtubs

TODAY...
it's shell casings

TOMORROW...
it may be another metal product

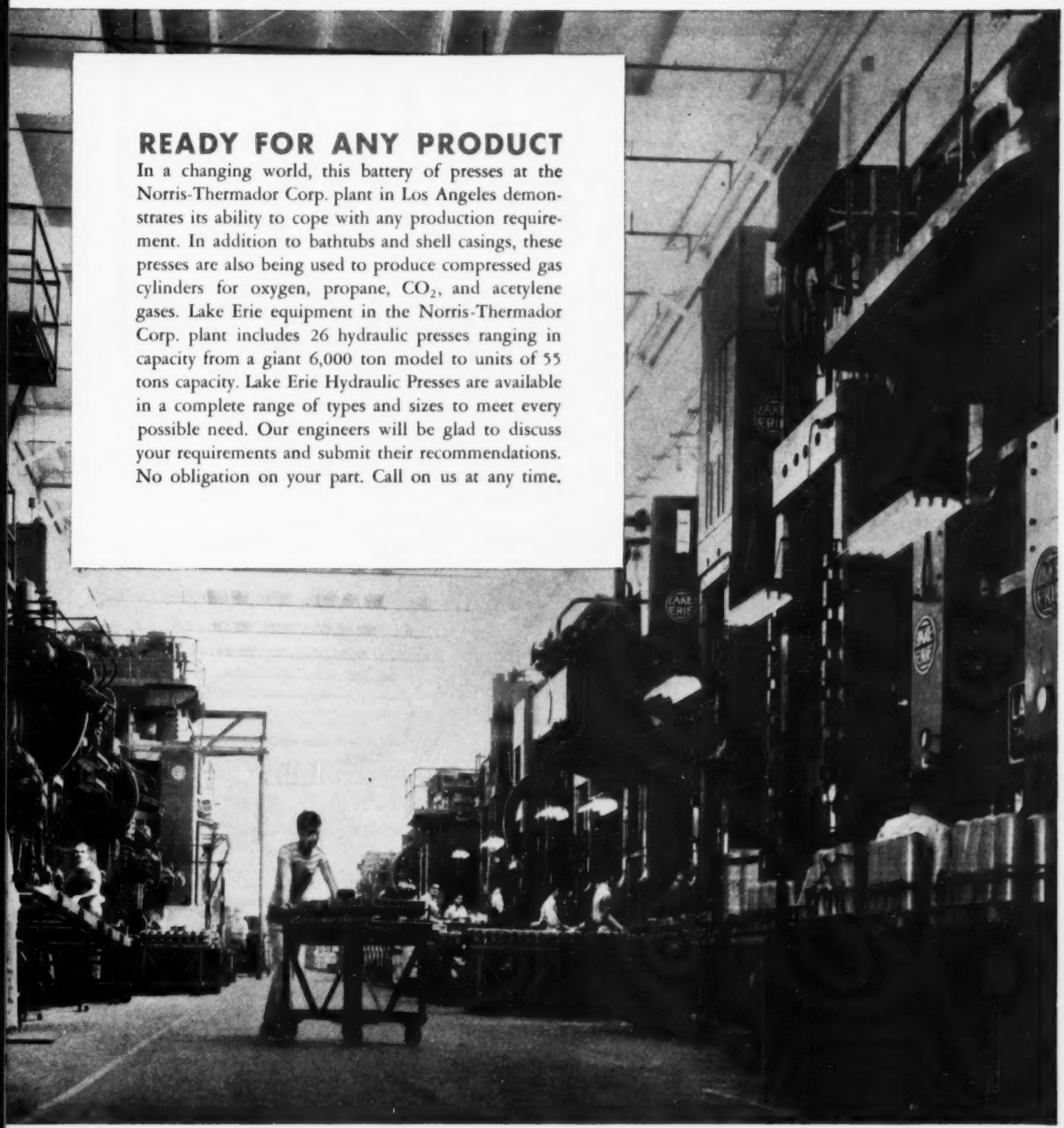
BUT...
these hydraulic presses will be ready for it.

Plant versatility is a mighty important asset... particularly today when products and markets are so prone to change on such short notice. When this versatility is coupled with high production efficiency, as it is with the fast Lake Erie hydraulic presses available today, your plant is equipped to return maximum yield on your investment. No matter what change-over you encounter—military to civilian, or vice versa...a model switch...the introduction of a new product...versatile and efficient Lake Erie Hydraulic Presses will enable you to make the change with a minimum of money, time and retooling. Why not investigate these advantages of Lake Erie Hydraulic Presses? Write or call us. No obligation.





● One of 26 Lake Erie Hydraulic Presses in the Norris-Thermador Corp. plant demonstrates its remarkable versatility. At left—drawing bathtubs, right—heading 105 mm. shell casings.



READY FOR ANY PRODUCT

In a changing world, this battery of presses at the Norris-Thermador Corp. plant in Los Angeles demonstrates its ability to cope with any production requirement. In addition to bathtubs and shell casings, these presses are also being used to produce compressed gas cylinders for oxygen, propane, CO_2, and acetylene gases. Lake Erie equipment in the Norris-Thermador Corp. plant includes 26 hydraulic presses ranging in capacity from a giant 6,000 ton model to units of 55 tons capacity. Lake Erie Hydraulic Presses are available in a complete range of types and sizes to meet every possible need. Our engineers will be glad to discuss your requirements and submit their recommendations. No obligation on your part. Call on us at any time.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

MANUFACTURERS OF HYDRAULIC PRESSES AND DIE CASTING MACHINES

General Offices and Plant
170 Woodward Avenue, Buffalo 17, New York

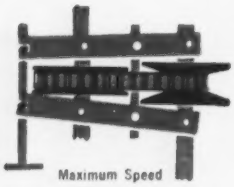
LAKE ERIE HYDRAULIC PRESSES are available in any size . . . standard, modified and special designs—horizontal and vertical types—for Metal Working—Plastics Molding—Forging—Metal Extrusion—Processing—Vulcanizing—Laminating—Stereotype Molding—Die Casting—Briquetting—Baling—Special Purpose.

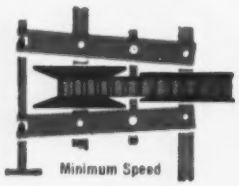
District Offices in NEW YORK • CHICAGO • DETROIT • PITTSBURGH
Representatives in Other Principal Cities in the United States and Foreign Countries
Manufactured in Canada by: Canada Iron Foundries Limited

LAKE ERIE ®

(For more information on products advertised, use Inquiry Card page 245)

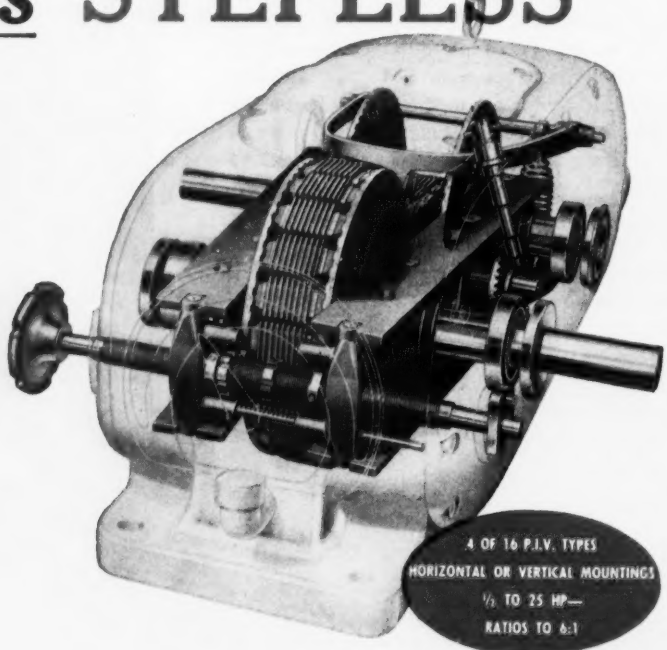
Always POSITIVE...
Always STEPLESS





Note how the effective diameter of P.I.V.'s wheels can be altered to change their ratio. You can select any point—from maximum to minimum setting—and get positive, accurately maintained speed.

ALL INDUSTRY USES P.I.V.*
*Positive, Infinitely Variable



4 OF 16 P.I.V. TYPES
HORIZONTAL OR VERTICAL MOUNTINGS
½ TO 25 HP—
RATIOS TO 6:1

P.I.V. Variable Speed Drive gives you infinite speed choices

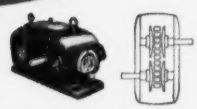
SELECT ANY SPEED within normal operating range, and you can always be sure Link-Belt's P.I.V. Variable Speed Drive will maintain it accurately under full load conditions.

P.I.V. is not dependent on friction for power transmission. Self-tooth-forming chain meshes with grooved wheels to provide positive, infinitely variable speed selection. Using P.I.V., your machines are capable of working to maximum capacity according to the job. Control can be manual or automatic while running under full load.

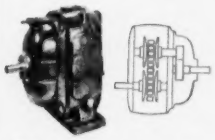
Link-Belt's P.I.V. Variable Speed Drive is compact. It is particularly adapted to delicate or sensitive manufacturing processes that require exacting variable speed transmission. Find out how you can increase the flexibility and efficiency of your machines. Call your nearest Link-Belt office today for complete, detailed information. Send for Catalog No. 2274.

P.I.V. LINK-BELT
VARIABLE SPEED DRIVE

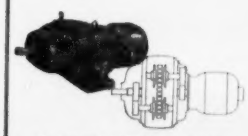
LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13,115



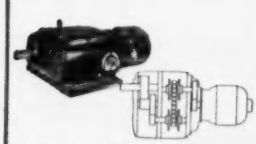
Basic, Positive, Infinitely Variable (P.I.V.) Speed Drive.



P.I.V. with single reduction input or output helical gears.



Motorized P.I.V. with single reduction input and output helical gears.



Motorized P.I.V. with single reduction input and double reduction output helical gears.

(For more information on products advertised, use Inquiry Card page 245)

Gardner Grinding increases production from 50 to 180 pieces per hour!

Replaces 2 milling operations on universal joint yokes

GARDNER precision disc Grinders



Grinds TWO parallel sides in ONE operation—and improves accuracy, too

121M

WORK DATA

MACHINE	No. 125-26" Gardner Double Spindle Grinder
PART	Universal Joint Yokes for automobiles and trucks
OPERATION	Grinding two parallel sides of yoke simultaneously
STOCK REMOVAL	.030" maximum overall
TOLERANCES	.0015" to .002" for squareness with hole; .001" to .0015" for uniformity; .003" or better for concentricity with splined hole
PRODUCTION	180 pieces per hour
TOOLING	Power operated sliding work table with work holding fixture

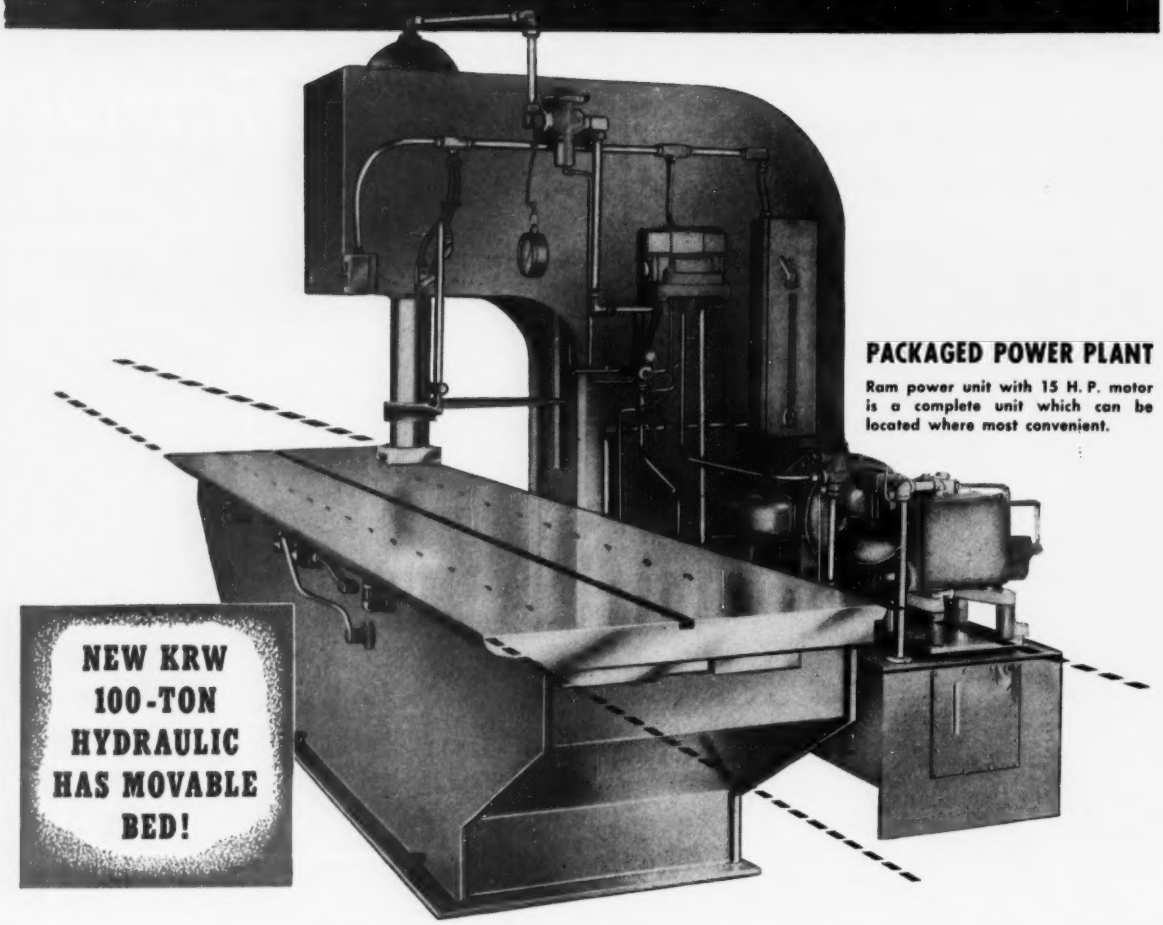


Send for new catalog

GARDNER MACHINE COMPANY

414 East Gardner Street • Beloit, Wisconsin, U.S.A.

NEW PRESS BRINGS THE WORK TO YOU!



NEW KRW 100-TON HYDRAULIC HAS MOVABLE BED!

PACKAGED POWER PLANT

Ram power unit with 15 H. P. motor is a complete unit which can be located where most convenient.

Here's KRW's newest time-saver! It's a 100-ton Hydraulic Press with an extra-long 16 foot bed that moves more than 3 feet in either direction. Now being used for important straightening work by some of America's largest manufacturers of airplane forgings. Due to the extra-long movable bed, straightening work on large pieces can be accomplished with greater facility and speed. Ideal for manufacturers and fabricators of extra-long parts that require straightening work. Press bed has independent motor drive. Hydraulic motor doesn't have to be running to move the press bed back and forth.

This new KRW press has a unique load-control feature. An applied ram load can be maintained at any pressure setting from 10 to 100 tons without holding manually controlled lever at applied position. Operator can bring ram load to desired tonnage and remove hand from control lever. Lever automatically returns to neutral but applied load will be retained until manually controlled lever is moved to reverse position for lifting ram. This feature saves time on straightening jobs where it is necessary to hold a given pressure for periods of time.

KRW also makes a full line of one, two and three cylinder Hydraulic Presses; hand, air or motor driven; 25-150 ton capacities. Write for details and prices on this or any KRW Hydraulic to Dep't. 15.

SPECIFICATIONS

CONSTRUCTION Cylinder—chrome-nickel-molybdenum steel; C-frame and bed, weldment fabrication; Table, steel.

TABLE CONTROL Separate push buttons for right and left movement. Table stops when manually applied push button is released.

SAFETY PROVISIONS Electrical System — disconnect switches, automatic and manual.

Hydraulic System—pressure relief valves eliminate danger of overload in any part of the Hydraulic circuit.

Table and Ram travel is limited by safety switches. Manually adjustable stop limits up-travel of ram.

K·R·WILSON

215 MAIN ST., BUFFALO 3, N. Y.



Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

(For more information on products advertised, use Inquiry Card page 245)



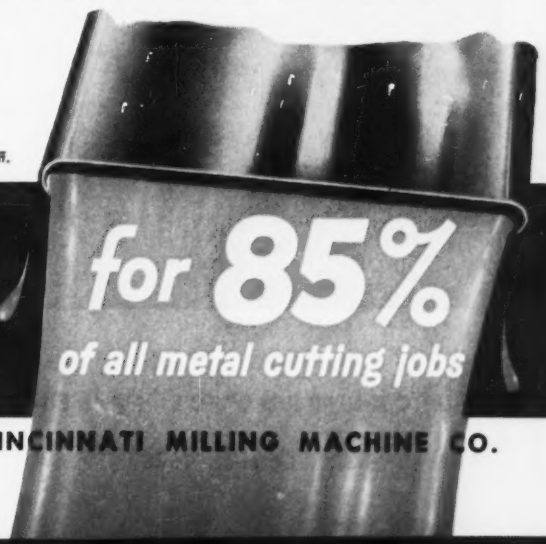
Why Cimcool will be the apple of your eye

. . . BECAUSE CIMCOOL° COVERS 85% OF ALL METAL CUTTING OPERATIONS! What's more, this radically new and different cutting fluid permits faster speeds . . . increases accuracy . . . helps increase tool life . . . and lowers costs while doing a better job.

Plant after plant enthusiastically reports that Cimcool is far superior to old-fashioned coolants. This revolutionary cutting fluid—this *chemical emulsion*—replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So Cimcool reduces down time and cuts labor costs for cleaning and changing.

We're sure you'll say, too, that Cimcool is the pick of the crop after just one week's run. For a demonstration, write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

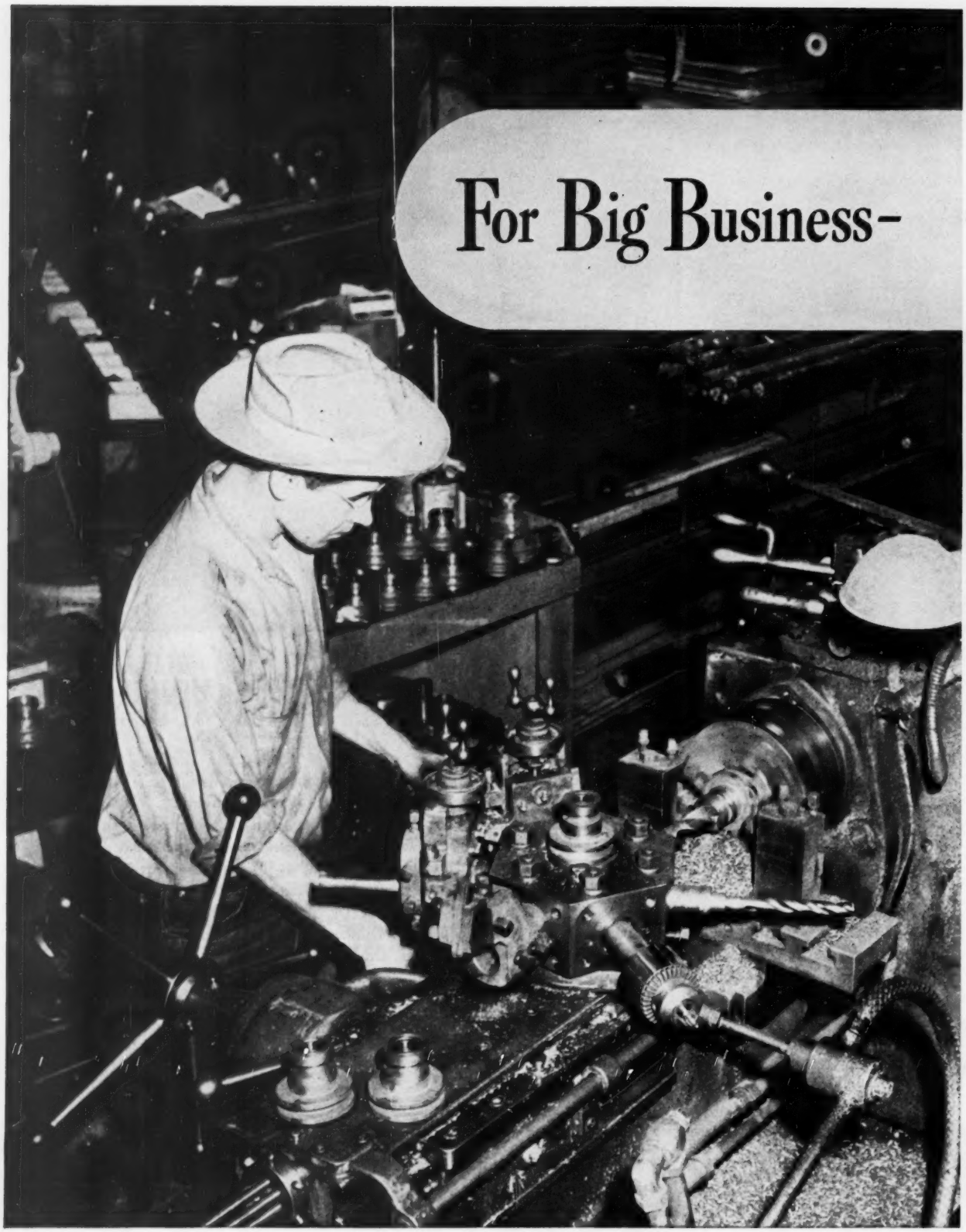
°Trade Mark Reg. U.S. Pat. Off.



CIMCOOL

for 85% of all metal cutting jobs

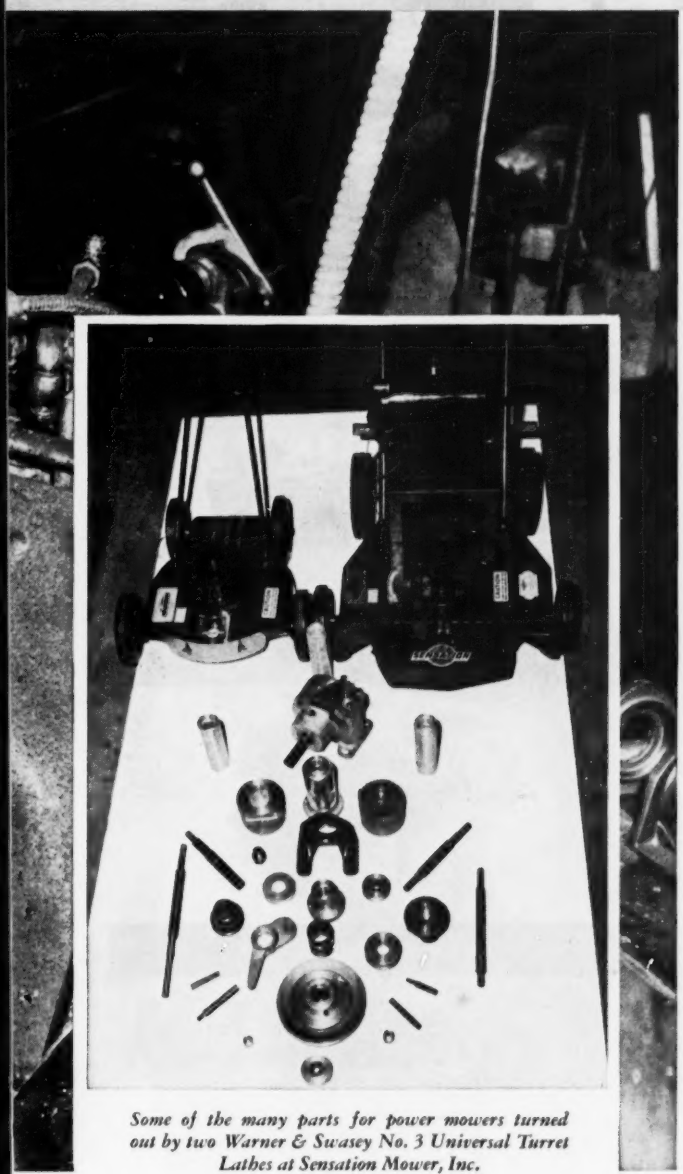
A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &



SURE...*and Small Business, too!*



Some of the many parts for power mowers turned out by two Warner & Swasey No. 3 Universal Turret Lathes at Sensation Mower, Inc.

SENSATION MOWER, INC., Ralston, Nebraska, is not a high production shop in terms of metalworking plants. But this relatively young company, using only two Warner & Swasey No. 3 Universal Turret Lathes for their entire metal turning needs, was able to compete effectively and grow in the power lawn mower field.

The two Warner & Swaseys give Sensation Mower the versatility they need to produce over 40 different parts for mowers. They also turn out parts for newer lines of snow removal equipment and power floor polishers. The Warner & Swaseys' versatility has even enabled the company to take on sub-contract work during their "off-season".

Both machines have had a total of *only one day's downtime* since their installation in 1946!

You can count on this kind of highly versatile, dependable production with Warner & Swasey Turret Lathes—money-makers whether you're a small manufacturer or in business in a "big" way!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

(For more information on products advertised, use Inquiry Card page 245)

hendey lathes are better built...

FOR LONGER, MORE ACCURATE LIFE!

And here's how it's done — Hendey starts with quality design and follows through with quality workmanship. Take the hardened and precision ground bed ways, for instance. Hendey does this differently *and better!* First, the world's most modern induction hardening equipment uniformly hardens the ways. Next, the precision machined legs and chip pan are attached to the bed (and they are never removed thereafter). Ultra precision grinding follows. Exacting checks for accuracy are then followed by electronic testing for hardness — uniform hardness — there are no soft spots in a Hendey bed — and a customer's test sheet proves it!

Add to this, quiet headstocks, the finest of lead screws, simplified, convenient controls and the ruggedness and power essential for modern precision turning.

Hendey lathes maintain the Hendey tradition for quality and accuracy. And there is the *right* machine in the Hendey line to suit your precision turning requirements. Write for details.

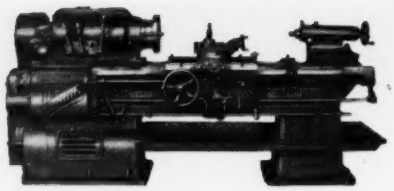
THE HENDEY MACHINE CO. HARDENED AND GROUND BED WAYS

Featuring uniformly hardened and precision ground bed ways.

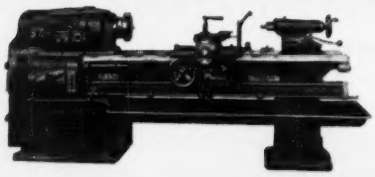
HENDEY

the Hendey machine co., inc.
torrington, conn., u.s.a.
——precision machine tools——

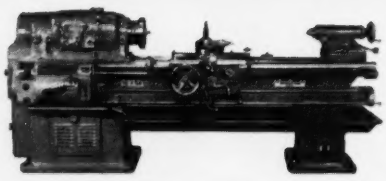
distributors in principal cities



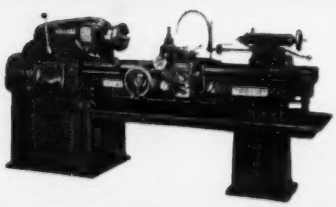
18″ — 20″ — 24″ 12-speed Geared Head Lathes



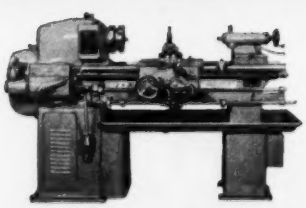
12″ — 14″ — 16″ 18-speed Geared Head Lathes



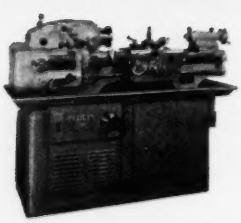
12″ — 14″ — 16″ 12-speed Geared Head Lathes



No. 2 General Purpose Lathe



No. 1 General Purpose Lathe



9″ x 24″ Tool & Gage-Makers' Lathe

(For more information on products advertised, use Inquiry Card page 245)

FEDERAL has *Everything* in Gages

for Dimensional Control

"AUTOMATION" The Newest Aid To Mass Production

AUTOMATIC SORTING GAGES

FEDERAL'S AUTOMATIC SORTING GAGES keep pace with modern mass production. The possibilities in multiplicity of dimensions, accuracy and speed are worth your investigation. Write for illustrated book.



AUTOMATIC GAGE sorts diameters into 21 categories.

LOOK INSIDE FOR DIAL INDICATOR GAGES

FEDERAL PRODUCTS CORPORATION

1110 EDDY STREET PROVIDENCE 1, RHODE ISLAND



FEDERAL has

MIKEMASTER

Indicating Micrometer

INSIDE DIAMETER GAGES

Wide diversity of types for various requirements from ⅛″ diam. up.

OUTSIDE DIAMETER GAGES

SNAP GAGES — to fit particular needs and all dimensions from 0″ up.

COMPARATORS

Electronic super-precise and Dial Indicator types to suit your particular need.

THICKNESS GAGES

Bench and Portable to suit special industrial specifications.

DEPTH GAGES

Faster and more accurate than old style flush pin gages.

THREAD GAGES

Thread Lead accuracy is as important as Pitch Diameter.

GAGE ENGINEERING

Over 30,000 special designs. We can modify stock gages to suit, or completely design and build gages to fit your need.

Printed in U.S.A.

Federal offers you: the greatest assortment of ready-made gages for inspecting all dimensions.



Everything in Gages for Dimensional Control



FEDERAL PRODUCTS CORPORATION

1110 EDDY STREET, PROVIDENCE 1, RHODE ISLAND, U. S. A.

FEDERAL has *Everything* in Gages

for Dimensional Control

Air Gages, Picture Panel, Continuous Measuring and Size Control Gages enable Federal to meet every dimensional control requirement.

DIMENSIONAIR — AIR GAGE

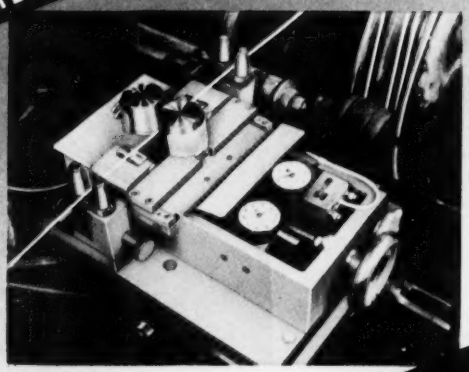




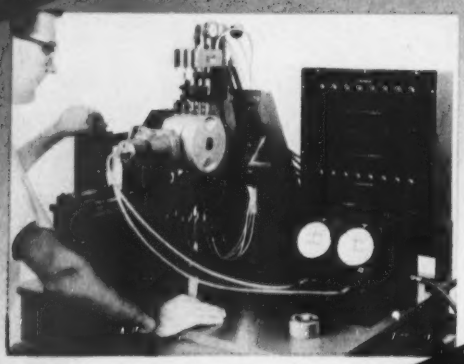
THE DIMENSIONAIR is really an outstanding gage. Its greater range, calibrated scale, stability, ease of setting, low maintenance, and the economy of its single master are well worth your investigation. Write for catalog.

At right: Two large diameter, *six*-jet plugs inspect thin rings for diameter at six points. Automatic guide sleeves on plugs make rings slip on easily.

PICTURE PANEL — CONTINUOUS MEASURING

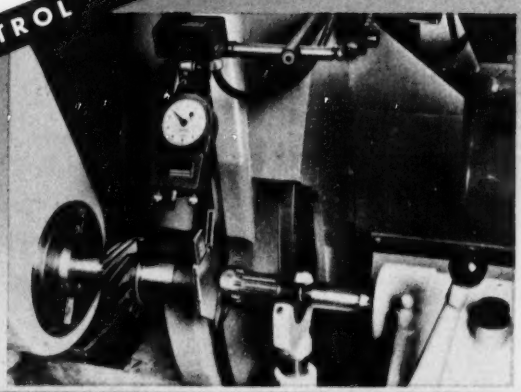


Right: Federal Continuous Gages not only measure the thickness of round or flat material but they control it by adjusting the machine to compensate for variations out of tolerance.



Left: Multiple dimensions are inspected simultaneously and quickly with Federal Picture Panel Gages. This one gages 10 dimensions in two operations. Both the Federal Dimensionair and Federal Electricators are used.

SIZE CONTROL



Automatic Machine Control for machining workpieces to size is a new Federal development that ties into modern trends. The gage automatically adjusts the machine so that all parts are produced in tolerance.

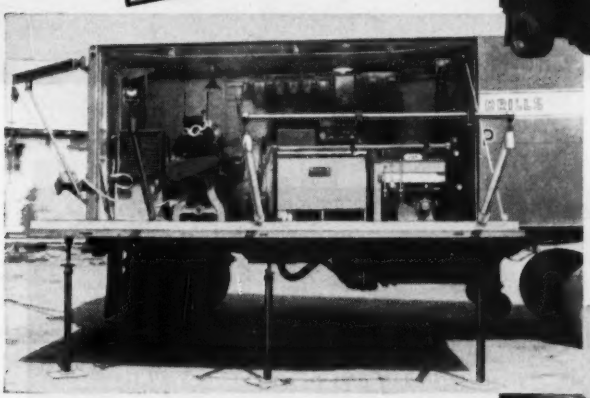
LOOK INSIDE FOR DIAL INDICATOR GAGES

FEDERAL PRODUCTS CORPORATION
1110 EDDY STREET PROVIDENCE 1, RHODE ISLAND

Announcing with "JOY"

Another TOCCO* First:





Induction Heating *on Wheels!*

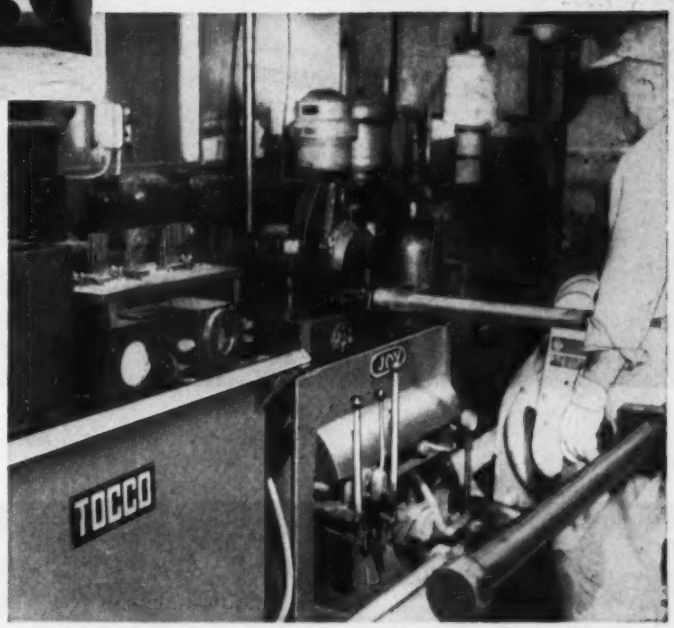
Joy Manufacturing Company's Mobile Shop for on-location reconditioning of mine drill steels.

BECAUSE of the size and length of mine drill steels, (some weigh as much as 320 lbs. and are 30 ft. long) much expense and lost time was involved in shipping them back to the factory for reconditioning. Realizing this problem, Joy Manufacturing Co., Pittsburgh, Pa., decided to send "Mohammed to the mountain" in the form of the *Joy Mobile Shop.*

The purpose of the Mobile Shop is to travel to designated territories in the United States, calling periodically on users of Joy's "Challenger" Drill. All broken drill steels are reconditioned on the spot—saving Joy's customers transportation costs and lost time.

The Joy Mobile Shop carries a 20 KW, 10000 cycle TOCCO Induction Heating machine, powered by a diesel-electric generator. The TOCCO unit heats the drill steels to 2200° F for upsetting, then reheats the upset ends to 1500° F for normalizing prior to machining.

This unusual application story is typical of the way TOCCO engineers team up with American Industry for better products and services, faster—and at lower cost.



Operator guiding drill steel in upsetter after heating end to 2200° F in TOCCO machine at left.

THE OHIO CRANKSHAFT COMPANY

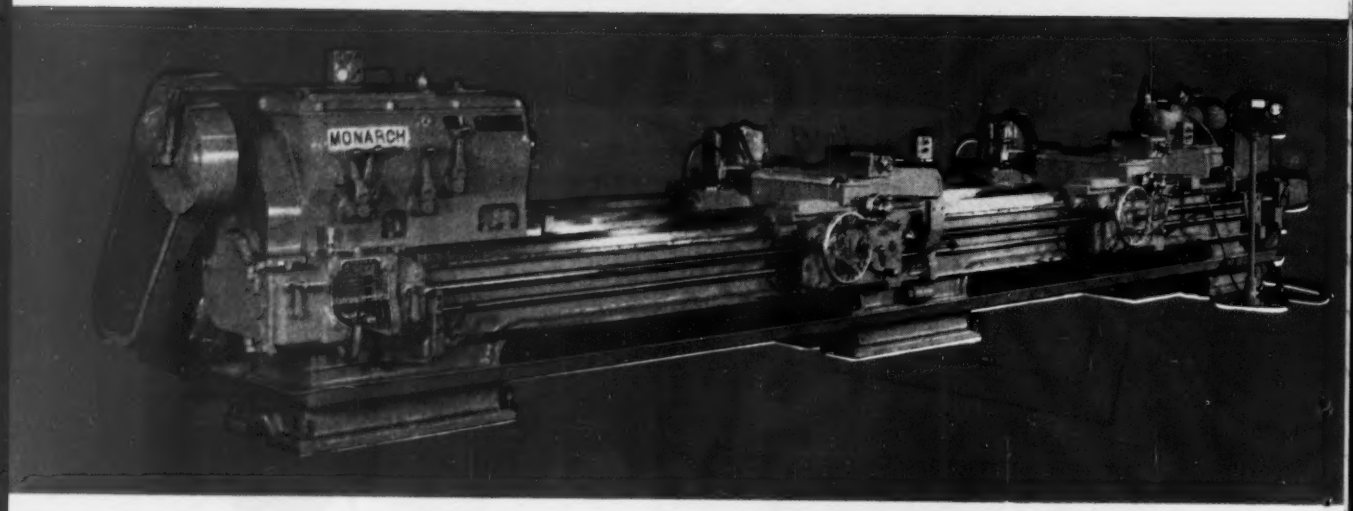


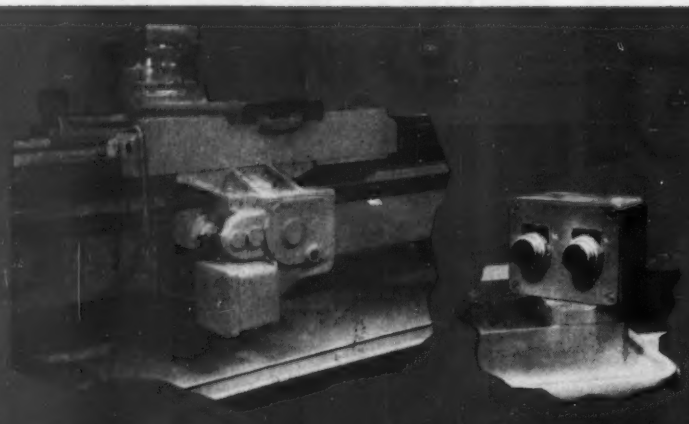
TOCCO

New Technical Film-

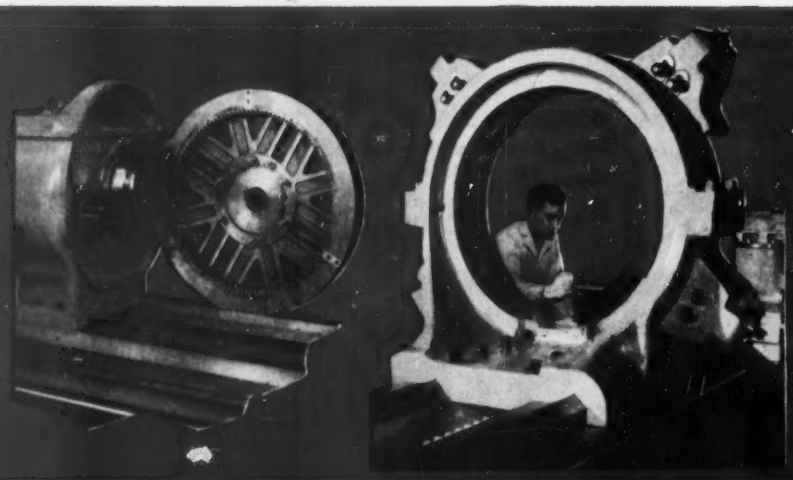
If you would like to see our new 30 minute color film—"The TOCCO Story" write on your company letterhead to The Ohio Crankshaft Co., Dept. W-10, Cleveland 1, Ohio.

(For more information on products advertised, use Inquiry Card page 245)

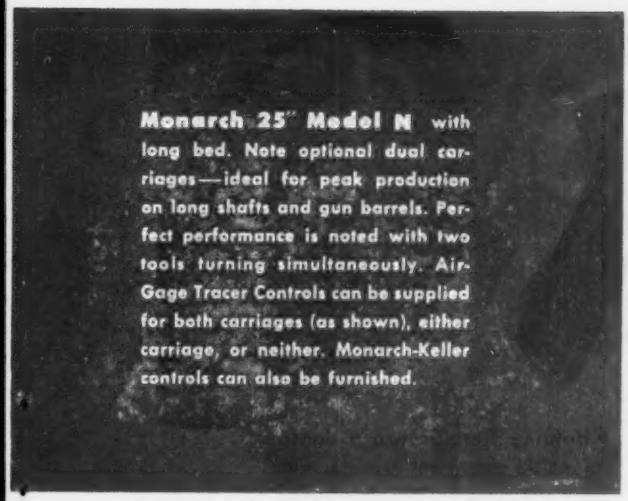




PLUS CONTROL. A smoothly functioning rapid traverse in either direction is furnished by unit mounted at rear of machine (left). Push button controls on front carriage wing (right) give instant response only when depressed. Standard on 25" Model N and 32" Model NN, optional on 20" Model M.



PLUS POWER. For heavy stock removal from large diameter work, the optional face plate drive headstock is a "must" (left). It insures full, even delivery of power under load. Drive may also be taken through spindle. Steady rests of great capacity and strength are provided. This one (right) will take work 36" to 38½" diameter.



Monarch 25" Model N with long bed. Note optional dual carriages—ideal for peak production on long shafts and gun barrels. Perfect performance is noted with two tools turning simultaneously. Air-Gage Tracer Controls can be supplied for both carriages (as shown), either carriage, or neither. Monarch-Keller controls can also be furnished.

BIG Monarchs

Powered like a Percheron





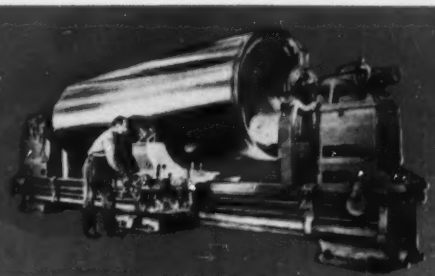
Nimble as a Pony

Imagine a great steel-muscled Percheron with the instant, spirited responsiveness of a polo pony—and you've got a picture of the Monarch Heavy Duty Lathes. Here are lathes with the size, power and rigidity to hog off heavy cuts from big work—yet built to provide high finish, close accuracy and convenience of operation! Witness the great number of them—both with and without Air-Gage Tracer controls—speeding production of critical jet aircraft parts today.

Here's unequaled strength and versatility within the capacities offered—20", 25" and 32" swings in standard lengths up to 324" between centers. Look at the special features and applications we've found room to illustrate here. Then write for our Booklet #1208—36 pages of data and pictures—for the complete Monarch Heavy Duty Lathe story. We'll send it gladly . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

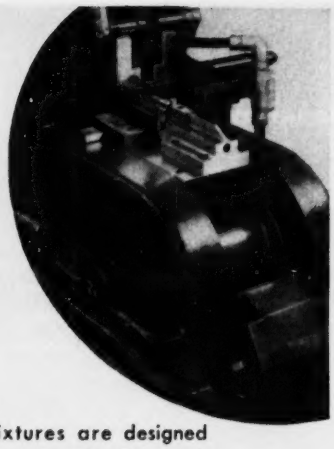
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES



PLUS SWING. For maintenance and repair work—for occasional big parts, light cuts on big diameters, and turning shafts with previously machined large sections, plus swing up to 60" and more can be provided. This Model SN, shown turning a paper machine drum, swings 84"





to cut
machining costs
machine faster
with
continuous
broaching

• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Cutting tool maintenance costs are low. We will be glad to make our recommendations on Footburt Surface Broaching Machines based on our many years in handling similar work.

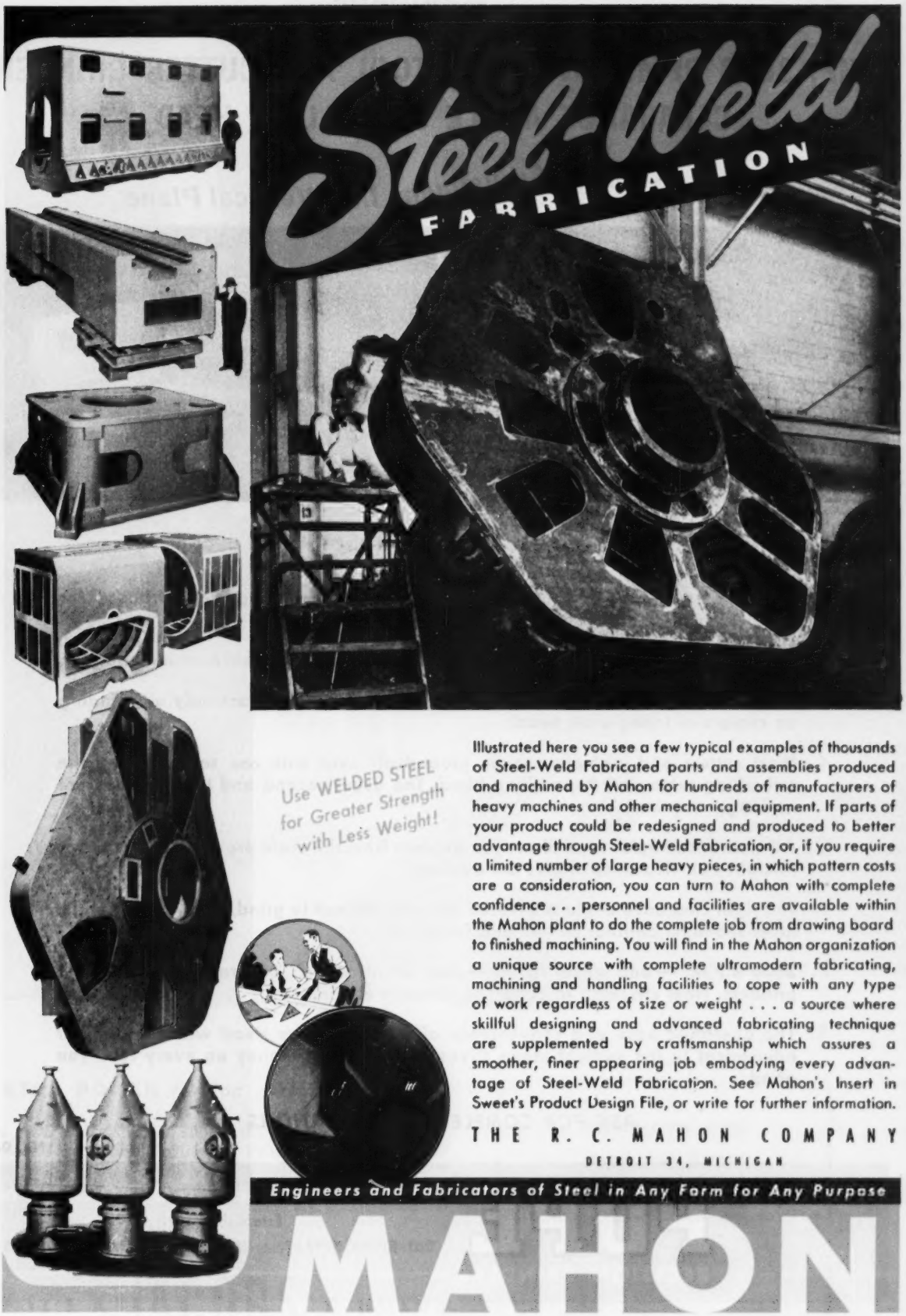
THE FOOTE-BURT COMPANY, Cleveland 8, Ohio
Detroit Office: General Motors Building



FOOTBURT

MACHINE TOOLS

(For more information on products advertised, use Inquiry Card page 245)



Use WELDED STEEL for Greater Strength with Less Weight!

Illustrated here you see a few typical examples of thousands of Steel-Weld Fabricated parts and assemblies produced and machined by Mahon for hundreds of manufacturers of heavy machines and other mechanical equipment. If parts of your product could be redesigned and produced to better advantage through Steel-Weld Fabrication, or, if you require a limited number of large heavy pieces, in which pattern costs are a consideration, you can turn to Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to do the complete job from drawing board to finished machining. You will find in the Mahon organization a unique source with complete ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or write for further information.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

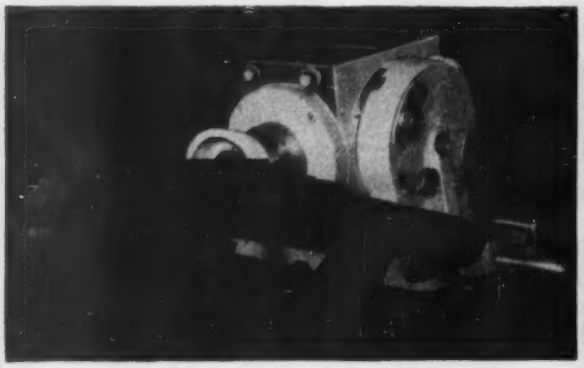
Engineers and Fabricators of Steel in Any Form for Any Purpose

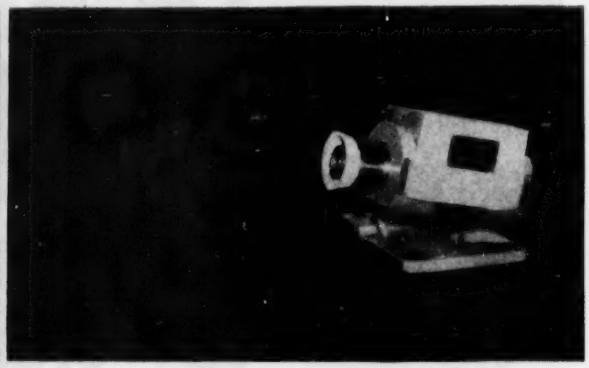
MAHON

(For more information on products advertised, use Inquiry Card page 245)

Specify THIS NEW POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD

With Angular Adjustment In A Vertical Plane





TIME AND MONEY SAVING FEATURES:

1. **Cup wheels, generally considered best for cutter grinding, can be used for practically all clearance angles on this new head.**
2. **Cup wheels produce a cutting edge on tools that lasts longer because it is stronger.**
3. **The tooth rest remains on the center line of the cutter for practically all grinding on centers or in the work head.**
4. **Most cutters and reamers can be ground all over with one set-up, using the swivelling table and Pope tilting head. The usual second and third set-ups are no longer required.**
5. **All clearance angles read directly in degrees from the scale provided on the head. Mistakes on clearance angles are avoided.**
6. **The right clearance angle is assured on tools difficult to grind, such as slab mills, taper reamers, angular cutters and form tools.**
7. **3600 R.P.M. — one wheel speed — safe for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.**
8. **The operating ease and convenience of this new Pope Head with the angular adjustment in the vertical plane saves you time and money on every tool you grind.**

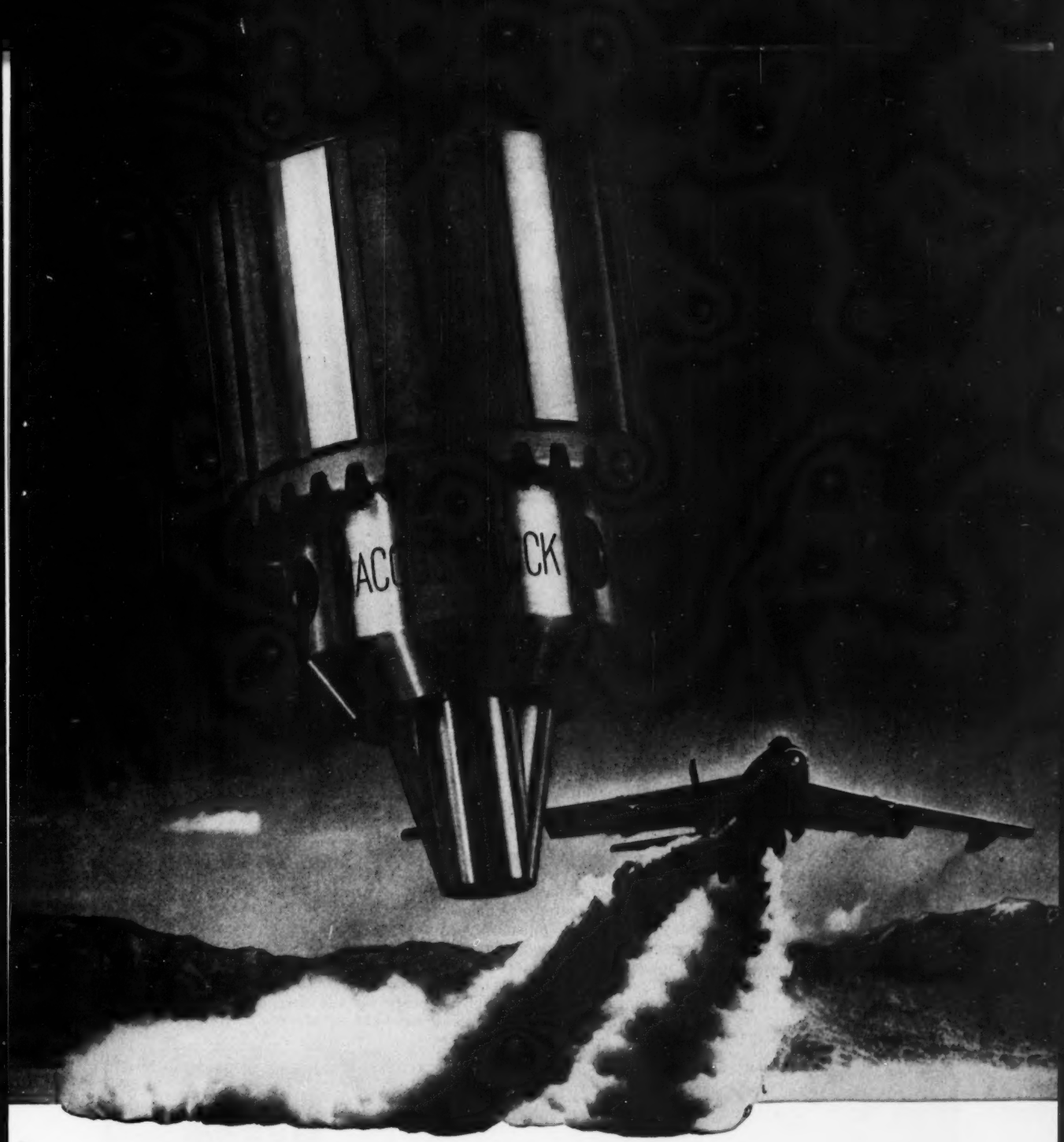
ASK FOR COMPLETE SPECIFICATIONS

No. 96

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

(For more information on products advertised, use Inquiry Card page 245)



EXTRA POWER *for top performance*

In A Jet Plane, rockets supply the extra launching power needed for fast-climbing takeoff. In industry, Jacobs Plain Bearing Chucks supply the extra gripping power vital to top performance in light- and medium-duty drilling. This, plus rugged construction and precision accuracy, makes them the world's most widely used chucks.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

. . . first in service

WHAT'S THIS?

HIGH SPEED 100% INSPECTION

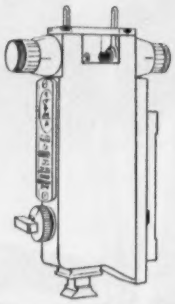
SIGMA



One machine is accurately checking 8 dimensions simultaneously—separating correct, oversize, and undersize parts at a rate of 2100 an hour.

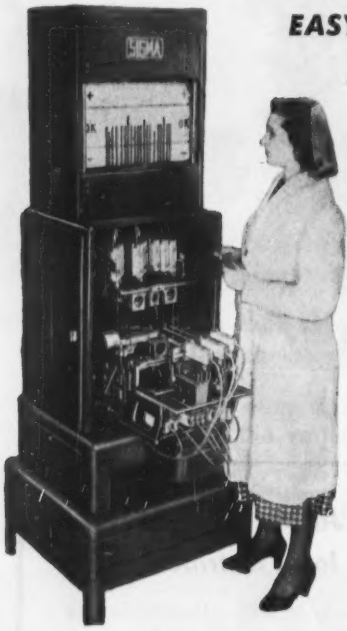
Two girls now handle an inspection job that formerly took six—and human errors have been eliminated.

Eight, standard Sigma gauges, like this one: have been mounted together for rapid, accurate inspection of mass produced parts. Each gauge, accurate to within .00005", measures one dimension. More (up to 30) or fewer gauges could have been used, depending on the number of dimensions to be checked. These gauges, with standard Sigma mounting units, and special fixtures where necessary, can be set up to inspect parts a fraction of an inch long, or several inches long, a foot, or longer.

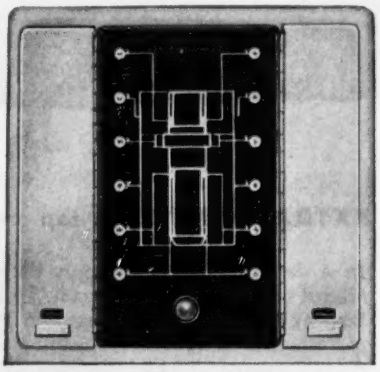


Depending on the arrangement, they can check internal and external diameters, length, depth, or other characteristics. The type of parts and the method of feeding determine inspection rates—hand feed: up to 600/hr.; semi-automatic: up to 900/hr.; fully automatic: up to 3500/hr. or more. Gauges are quickly and easily set to required tolerances and change-over from inspecting one type of part to another can be done within 10 or 20 minutes.

EASY-TO-READ INDICATORS WITH SIGMA EQUIPMENT



The semi-automatic Turbine and Compressor Blade Inspector (left) is an excellent example of Sigma's solution for a difficult inspection problem involving 18 dimensions. Fixtures are replaceable—each machine can inspect a wide range of different type parts. Gauges are connected to a Liquicolumn Indicator which has tubes of colored liquid set beside graduated scales—liquid levels indicate actual sizes of dimensions being checked. Magnifications can be varied easily by the user. Alternate indicator (right) uses electrical signals—green light for acceptable parts, red lights indicate dimensions below tolerances, yellow lights for those over. Built-in counters tabulate the number of parts submitted for inspection and the number accepted.



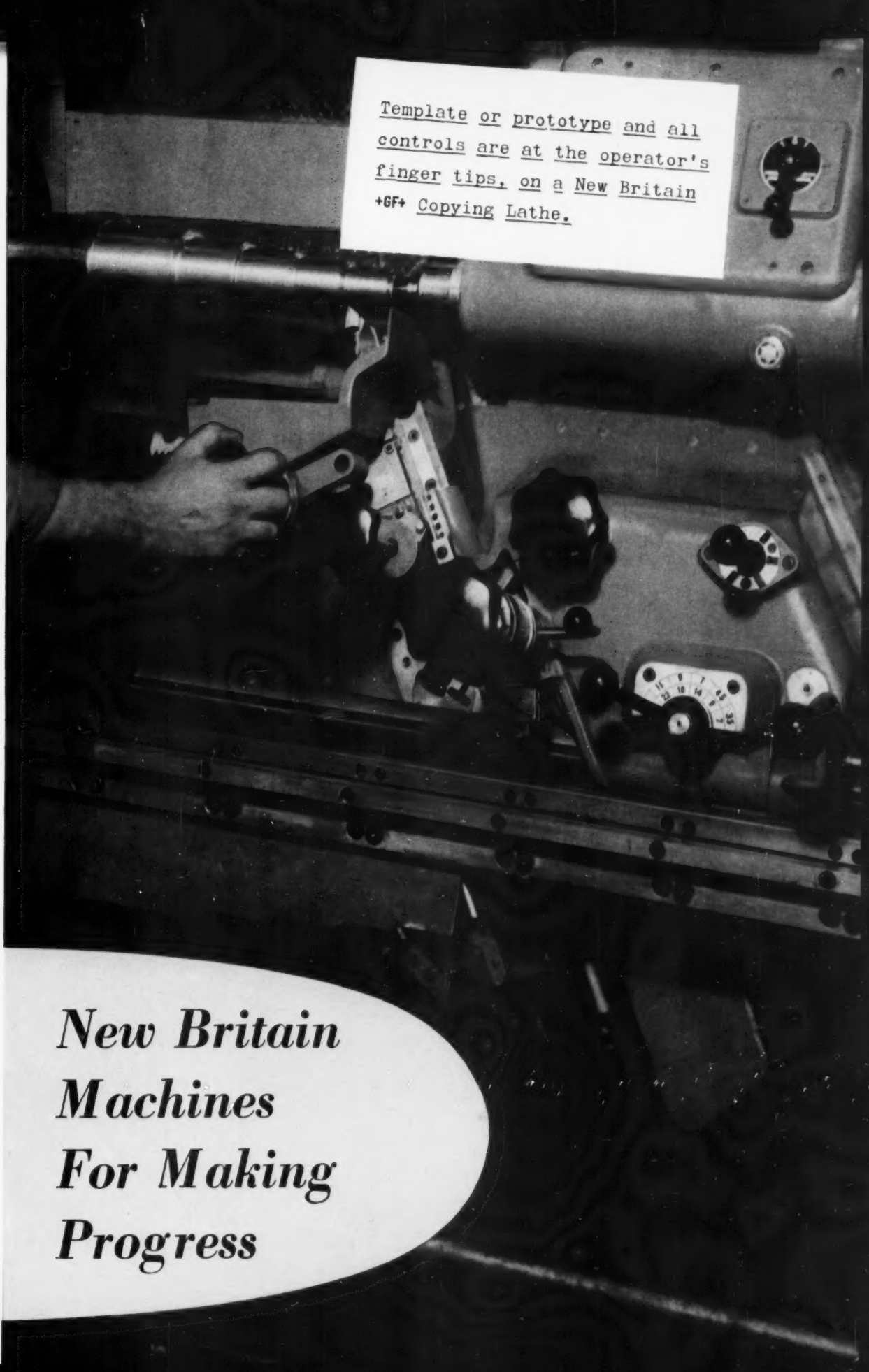
Contact us and get details on the Sigma equipment best suited to your high speed, multi-dimensional inspection problems.

COSA CORPORATION
405 Lexington Ave., New York 17

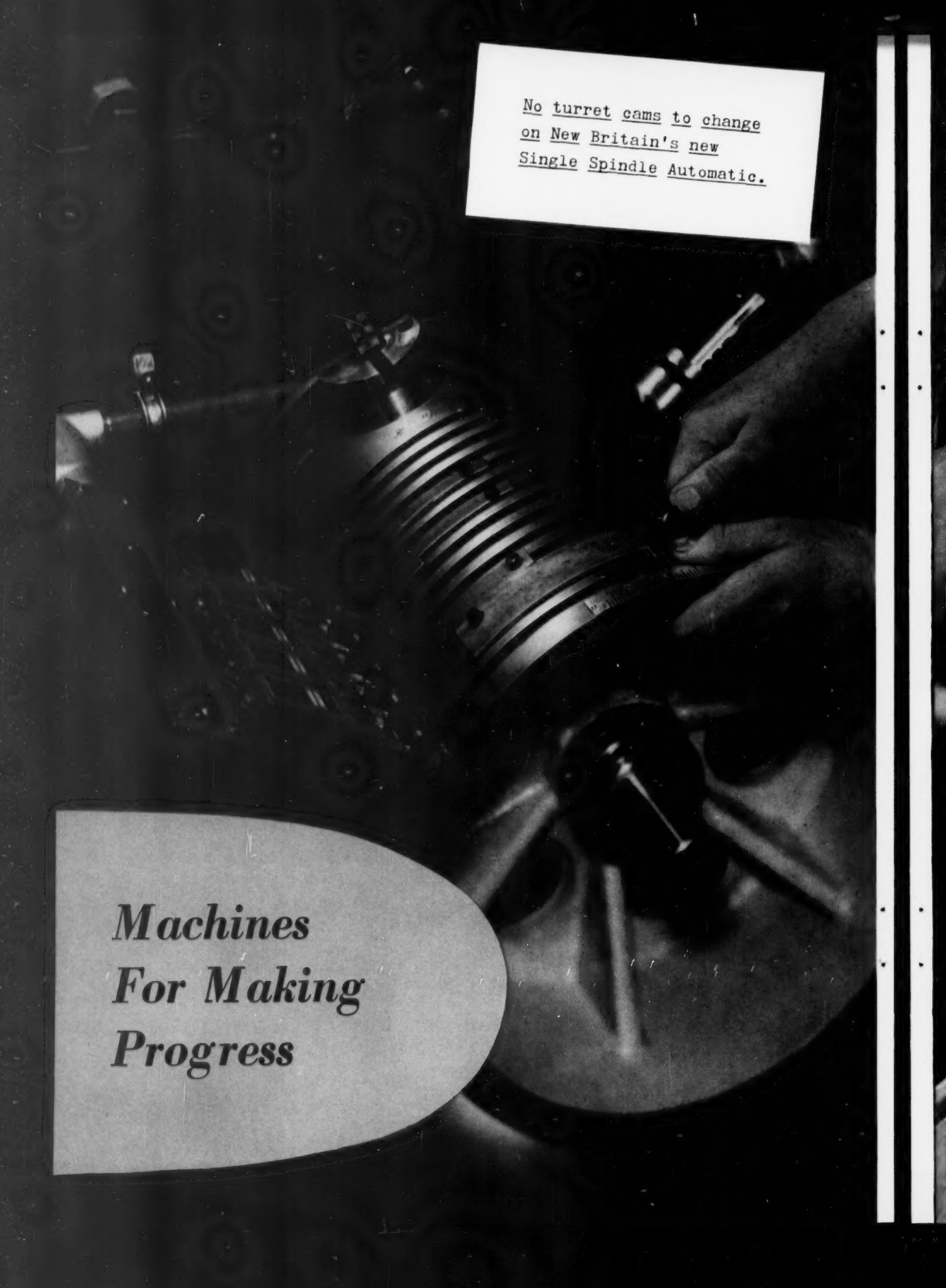
Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

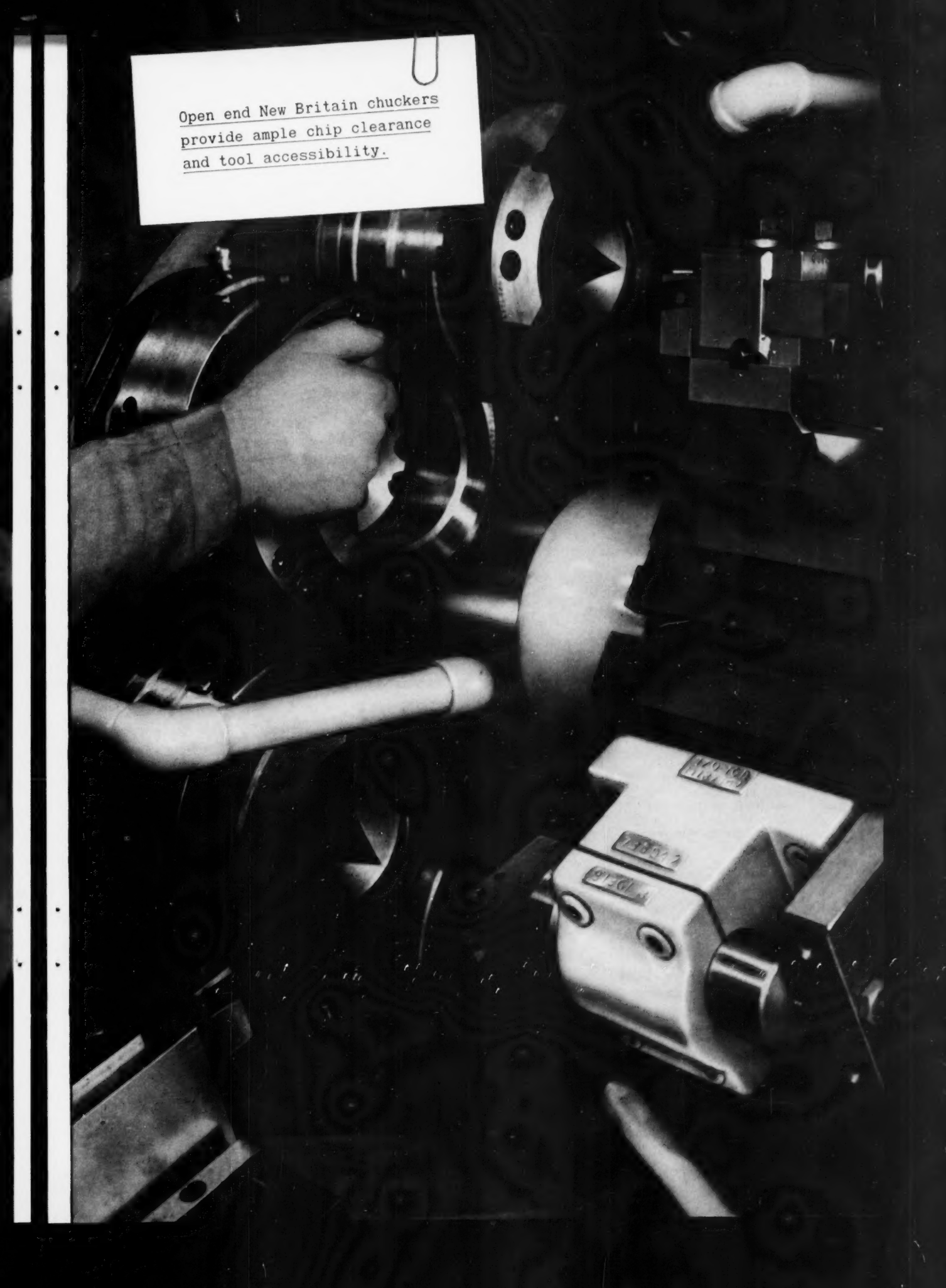
IN DETROIT AREA **contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.**

(For more information on products advertised, use Inquiry Card page 245)



New Britain Machines For Making Progress


No turret cams to change
on New Britain's new
Single Spindle Automatic.
Machines
For Making
Progress



Open end New Britain chuckers provide ample chip clearance and tool accessibility.

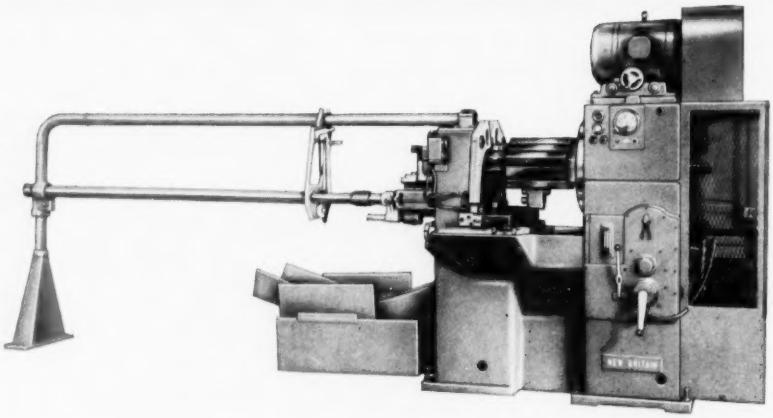
New Britain +GF+ Copying Lathe

Built on a new principle, with copying saddle mounted below the spindle and no conventional bed to accumulate chips which fall free and accumulate through the back of the machine. Every control is at the operator's finger tips. Template or prototype is also on operator's side. Powerful drive and a wide range of speed and feed ranges make it a profitable producer on short or long runs.



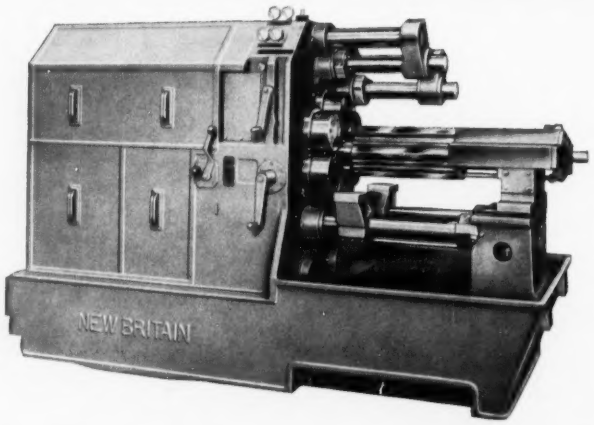
Model 126

New Britain single spindle automatic which belongs in almost every turret lathe department — to cut costs on pieces on the border line between turret lathe and multiple spindle production. Remarkable for mechanical simplicity and simplicity of operation. A new approach in single spindle turning, it incorporates features which guarantee quick set up and manpower savings, on both short and long runs.



Model 675

Six spindle automatic chucking machine. This line of New Britains includes four, six and eight spindle machines, notable for rigidity, accessibility and permanent accuracy. Open end construction makes tooling, loading, operating adjustments and chip removal simple and easy, reducing down time to a minimum. This, combined with ample power and high spindle speeds, makes them outstanding for sustained high production.



NB LUCAS OF CLEVELAND

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING & MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES

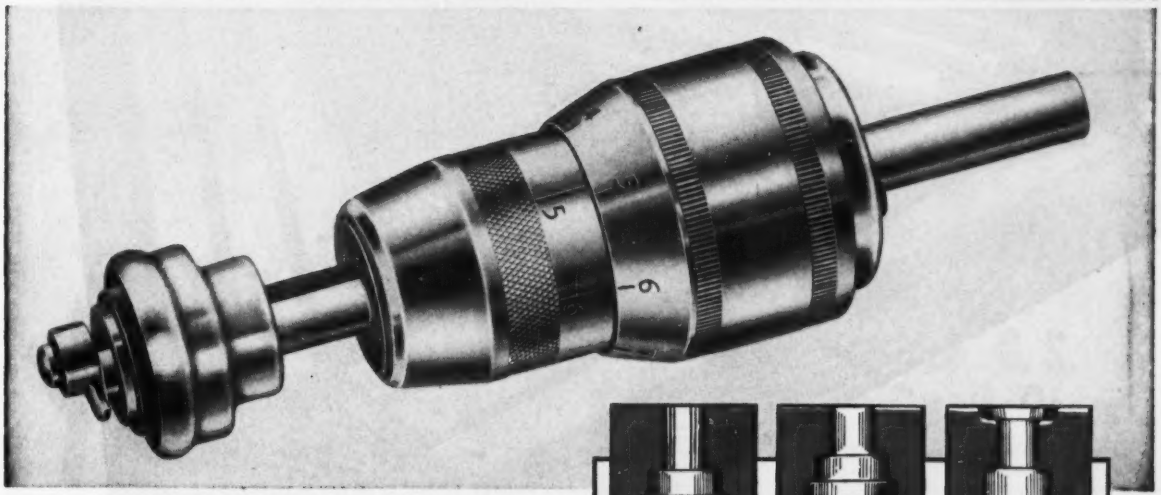
The NEW BRITAIN MACHINE COMPANY

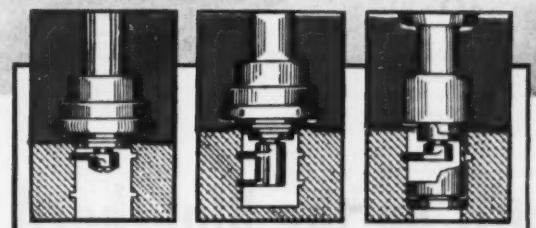
New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!





Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

Write now for Catalog giving mechanical details, cutting sizes...extra features...full information



WALDES TRUARC
REG. U. S. PAT. OFF.
GROOVING TOOL

WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N.Y.
Waldes Truarc Grooving Tool
Manufactured under U. S. Pat. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, New York M-105

Please send me complete information on Waldes Truarc Internal Grooving Tool.

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone____ State_____

(For more information on products advertised, use Inquiry Card page 245)



Put it on the Blanchard...

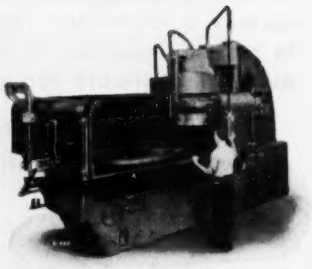
it takes 1/5th the time!

Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

It formerly took 45 hours, floor-to-floor, to grind these nine hardened steel machine tool ways. They are 2½" x 3½" x 50" and hardened to Rockwell C-60-63.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder — nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .0001", flat within .0001" with surface finish of 5 micro-inches. The Blanchard **cut time to 9 hours,** floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".



This is the largest Blanchard Surface Grinder, No. 42-72-84.



Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

(For more information on products advertised, use Inquiry Card page 243)

GET OUR *Free* 6-PAGE FOLDER

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!



You'll Remember the Quality of G.S. Small Gears

If their memories were as good as an elephant's, our oldest customers couldn't recall ever getting *troublesome* G.S. Gears. Why? Because *every one is made exactly right* . . to equal or exceed specifications. Continuous rigid inspection follows them every step of the way! As the world's largest designers and manufacturers of Small Gearing, *exclusively*, you can expect G.S. to deliver TOP quality, in production quantities, quickly, efficiently, economically. For your own best interests try this better Small Gear Service soon.

FRACTIONAL HORSEPOWER

GS GEAR

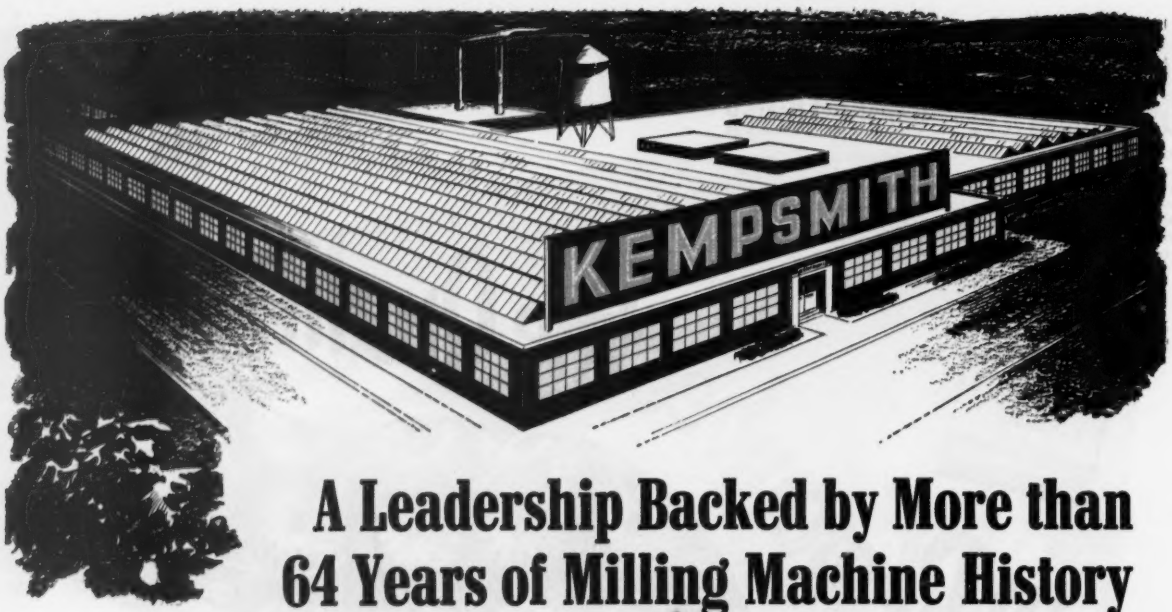
Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

(For more information on products advertised, use Inquiry Card page 245)



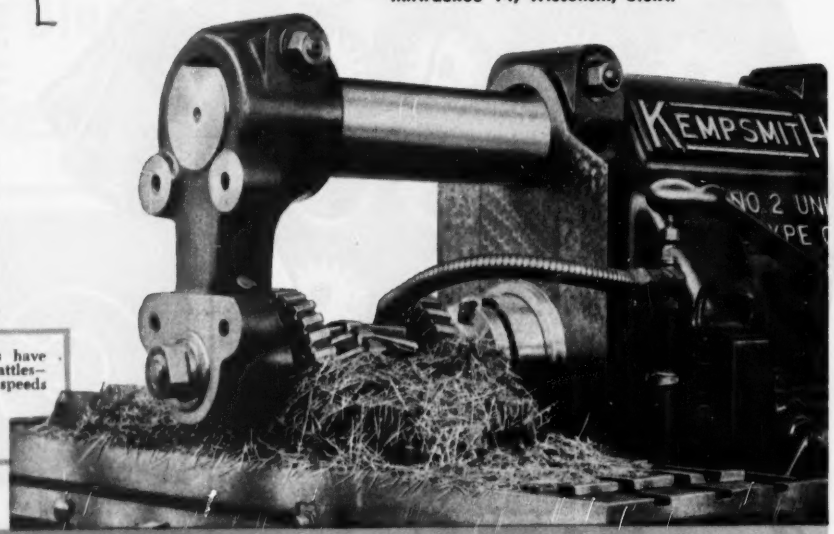
A Leadership Backed by More than 64 Years of Milling Machine History



Kempsmith Type "C" Plain Miller. All geared for positive power and smooth cutting, free from chatter. Note rugged, streamlined appearance. All controls are grouped within easy reach of the operator. Available in No. 1, 2 and 3 sizes, plain and universal models.

Back in 1888, Kempsmith Engineers developed and produced the first Kempsmith Miller — a machine that was destined to achieve world-wide fame. The successful performance of this early model encouraged important engineering improvements and refinements resulting in much greater speed and precision in milling operations. Today, Kempsmith continues as a leader in the industry. The ruggedness, precision and ability to take heavy cuts smoothly make Kempsmith Milling Machines ideal for production, toolroom or general purpose milling. If you have a milling problem, consult Kempsmith. Our engineers will gladly give you the benefit of their broad experience in this specialized field.

THE KEMPSMITH MACHINE CO.
Milwaukee 14, Wisconsin, U.S.A.



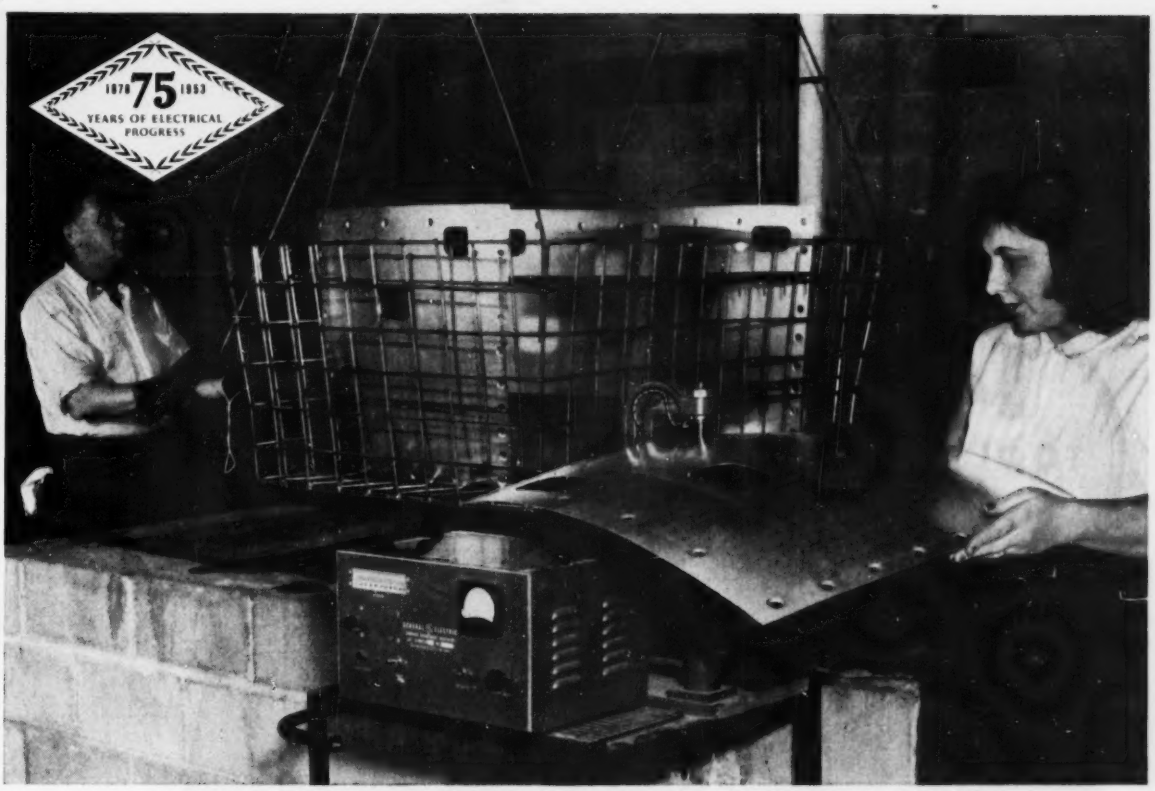
Let the chips fly— Kempsmith Millers have what it takes for rough production battles—built-in ruggedness, increased range of speeds and feeds, greater power. Every machine is precision-built, the product of 64 years of milling machine experience.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

A-7270-1PC

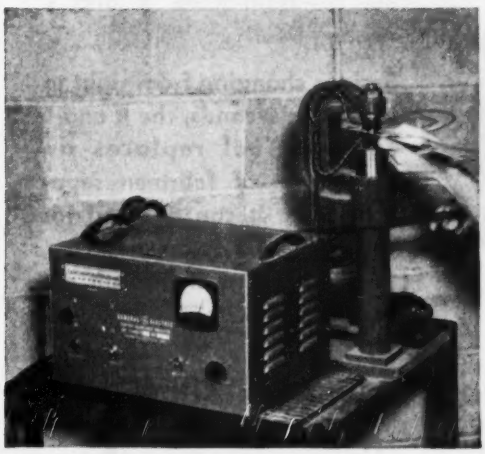
(For more information on products advertised, use Inquiry Card page 245)



EASY OPERATION OF INDICATOR PERMITS PARTS FOR 12-HOUR PRODUCTION TO BE CHECKED IN 15 MINUTES

Fast testing for better aluminum welds

Guesswork taken out of welding preparation by G-E Surface Resistance Indicator



ON PRODUCTION TESTING, operation requires no technical knowledge and is completed in seconds.

Spotweld Co., of Cleveland, Ohio uses a General Electric Surface Resistance Indicator in the preparation of aluminum parts for welding. Fabricating parts for aircraft, refrigerator units, tie rails, and vending machines, the company carefully checks surfaces to be welded after degreasing and deoxidization.

"Our G-E indicator has taken the guesswork out of preparation of aluminum for good welding," the company reports. In addition, all parts to be welded can be checked in fifteen minutes for a twelve-hour production period.

Surface resistance of aluminum is important in condition of the weld nugget. If cleaning and deoxidizing solutions become contaminated, metal is not thoroughly prepared—and good welds cannot be obtained. Large changes in resistance will result from relatively small changes in concentration or contamination of solutions.

Electrode pickup, inconsistency of welds and metal expulsion can be greatly reduced by use of the indicator. Further information can be obtained from your nearest G-E Apparatus Sales Office, or write for Bulletin GEA-5823 to General Electric Co., Section 687-121, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

(For more information on products advertised, use Inquiry Card page 245)

R AND L TURNING TOOL — prized POSSESSION

14 TOOLS IN 1



Machinists treasure quality tools! That's why they have created a constant demand for the precision-made R and L Turning Tool.

Besides changing from right to left in ten seconds, the R and L Turning Tool replaces an assortment of fourteen separate tools. It can be used for rough as well as finished cuts, meeting the most difficult job requirements.

the tools a particular machinist would design for himself . . .

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS • RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER

(For more information on products advertised, use Inquiry Card page 245)



...with TYCOL lubricants on hand!

The "All-Weather" Bearing Lubricant! Steel mills have shown a lively interest in Tycol Acylkup 4, a year 'round bearing grease that does a variety of jobs with a complete disregard for thermometer readings. Although all methods of application are suitable, one "3-Furnace" mill has found it particularly adaptable for use in its automatic grease systems -- with complete ease of pumping even in the coldest weather. From Blast furnaces: Sheave Bearings, Bell Mechanism, Skip Hoists, etc. . . . to Coal and Ore Bridges, Tycol Acylkup 4 is a natural for lubricating yard equipment in every steel mill. With two big savings: "all weather" protection . . . and lowered maintenance costs on automatic pressure systems. For details, contact your local Tide Water Associated office!

TYCOL
INDUSTRIAL LUBRICANTS

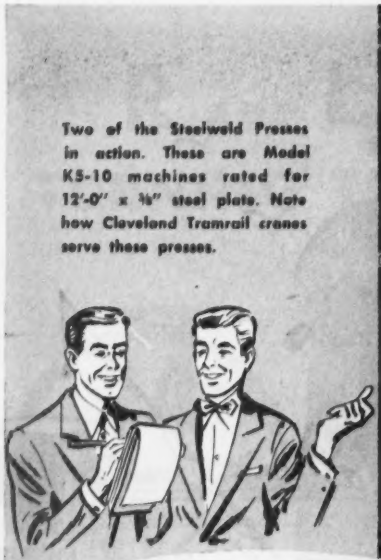
Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco
Toronto, Canada

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE NEW YORK 3, N. Y.

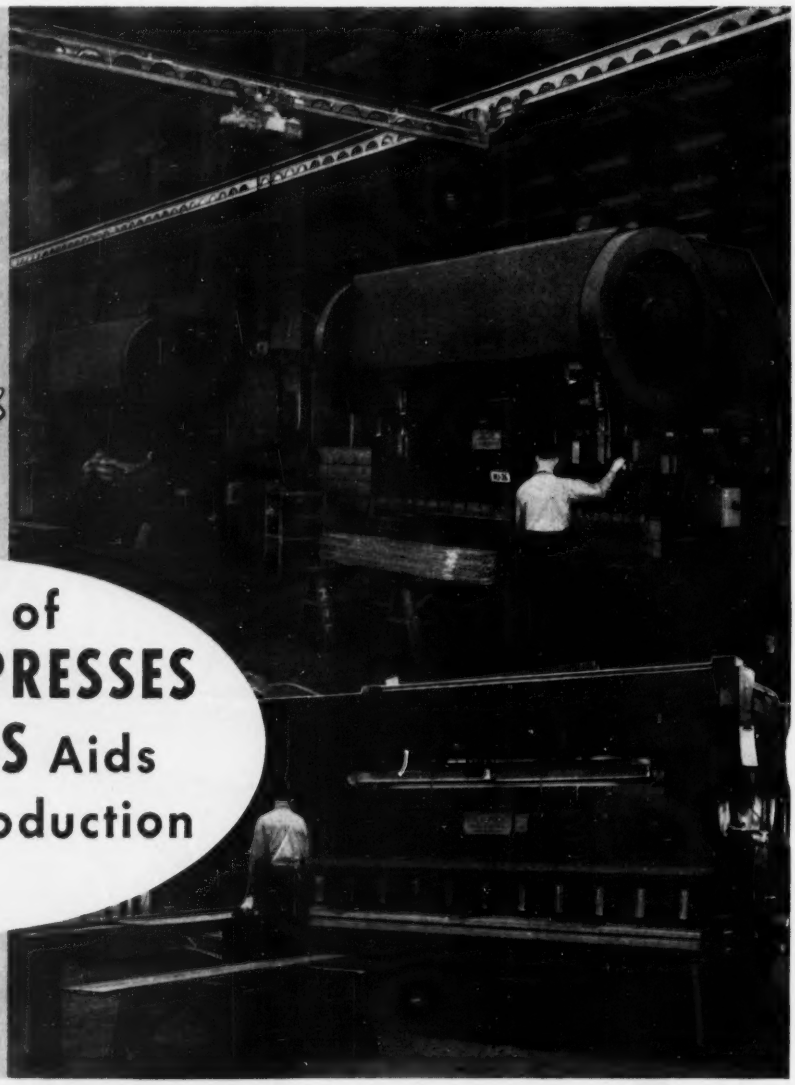
Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

(For more information on products advertised, use Inquiry Card page 245)



Two of the Steelweld Presses in action. These are Model K5-10 machines rated for 12'-0" x ½" steel plate. Note how Cleveland Tramrail cranes serve these presses.



Battery of STEELWELD PRESSES and SHEARS Aids Caterpillar Production

Shearing long ½-inch thick strips into small rectangles on a Series 8D-10 Steelweld. The long extension squaring arm at front facilitates this work.

THOUSANDS of tons of steel of different thicknesses are sheared and formed on Steelweld Shears and Presses into various shapes required for the large volume of tractor equipment produced at the new Joliet, Illinois, plant of Caterpillar Tractor Co. These items include scrapers, rippers, bulldozer blades and wagons.

The heavy construction of Steelweld machines and many high quality features with which they are provided make possible continuous trouble-free performance. Their design includes a number of innovations which ease operation, speed production and enable accuracy to close tolerances.

The fact that Caterpillar has bought Steelweld Shears and Presses repeatedly and now has a large battery of them is mute testimony to the satisfaction they are giving.



GET THESE BOOKS!

Catalogs No. 1010 (Presses) and No. 1011 (Shears) give construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5450 East 281 St. Wickliffe, Ohio.

STEELWELD

PRESSES and SHEARS

(For more information on products advertised, use Inquiry Card page 245)



CLE◇FORGE *High Speed* DRILLS

Give More Holes Per Grind

On every job – no matter how difficult it may be – you'll appreciate the *extra* quality in these famous drills. They produce better work faster, at lower cost. No other drill gives you such outstanding *performance* and *economy.*

THE **CLEVELAND** TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

LONG LIFE!

1

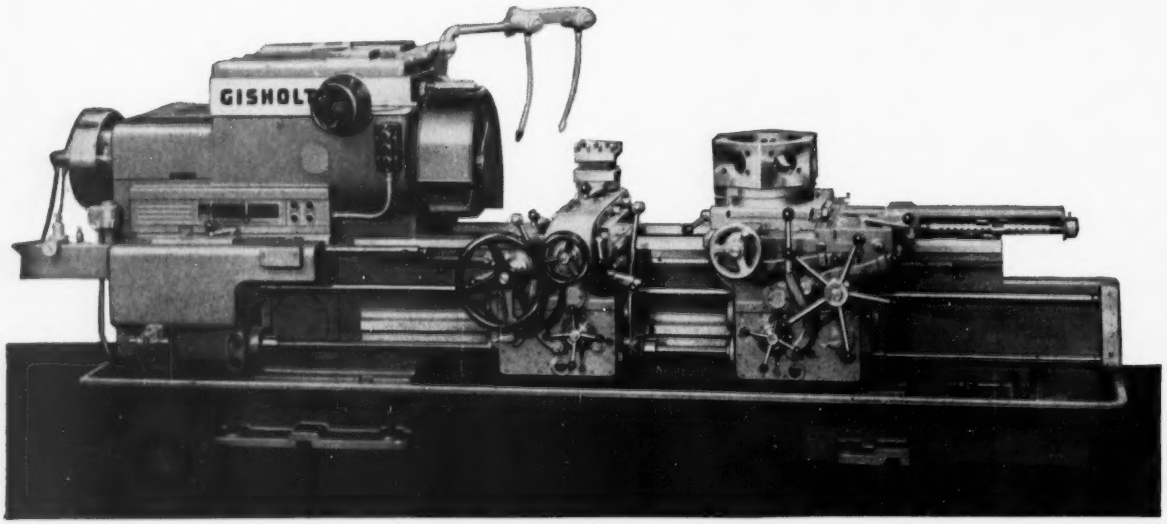
All gears in Gisholt turret lathe transmissions are high carbon alloy steel, precision ground after heat-treatment to assure long wearing quality. All shafts turn on antifriction bearings, with pressure spray lubrication. Headstock is cast integral with bed for extreme rigidity—to maintain accurate, permanent alignment.

2

Gisholt's thick, block-type ways are automatically pressure lubricated. Made of SAE 52100 tool steel, they are deep hardened to 64-66 Rockwell C and then finish-ground for exact alignment with the spindle. On top, bottom and both sides, they present a bearing surface that is virtually wear-proof—accurate for years to come.

3

Aprons are fully enclosed, all working parts protected and operating in a continuous cascade oil bath. Alloy steel gears and shafts are mounted on antifriction bearings. Positive serrated feed and traverse clutches cannot slip or drag. Safety shear pins protect feed and traverse mechanism against overload and accident.



You'll find all the speed and easy operation you want in these new Gisholts. But you want long life, too. Here's the lasting accuracy, freedom from repair bills and proved performance that protect your turret lathe investment for years to come.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

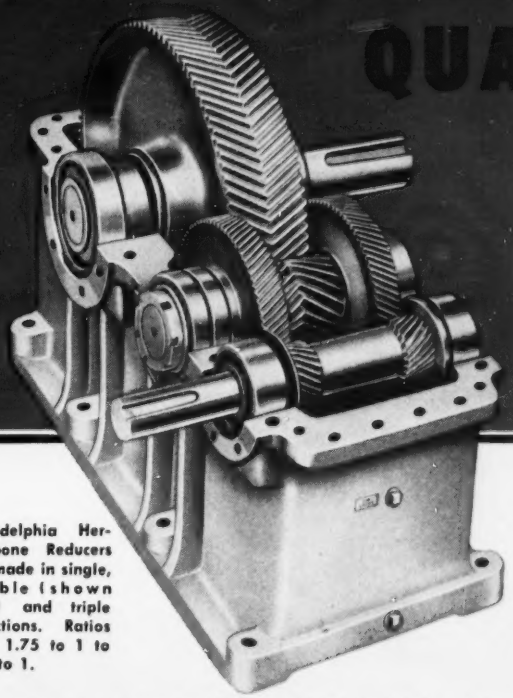
TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

(For more information on products advertised, use Inquiry Card page 245)

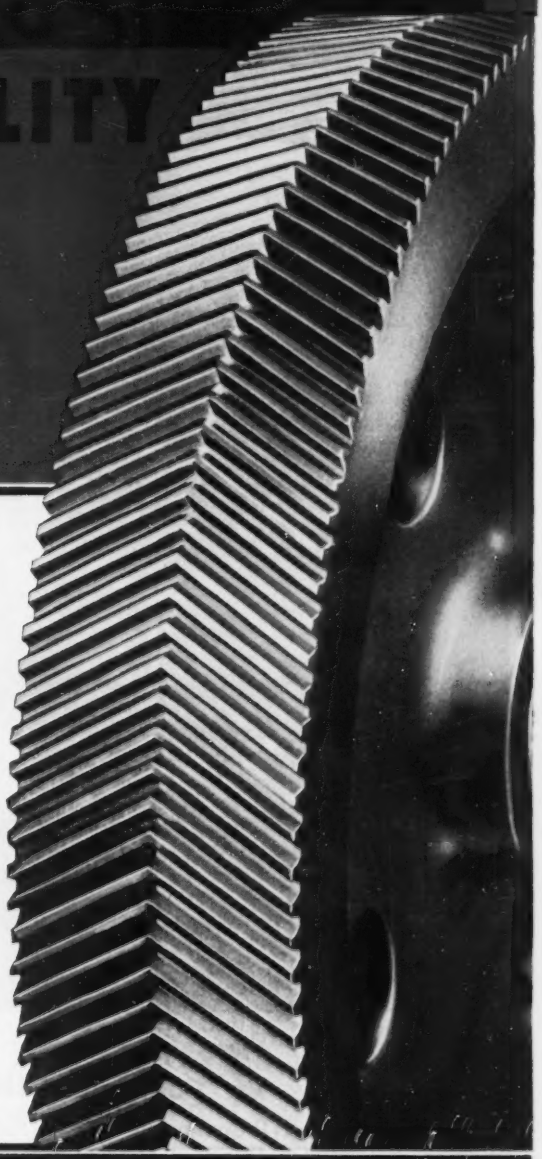
THERE'S NO DOUBT . . . THEY HAVE

"Custom Built"

QUALITY



Philadelphia Herringbone Reducers are made in single, double (shown here) and triple reductions. Ratios from 1.75 to 1 to 292 to 1.



As a unit of a "standard line", the Philadelphia Herringbone Speed Reducer cannot be excelled. Its superiority of design and workmanship reaches the heights of custom built quality . . . yet every part is "standard".

Of the hundreds of Units passing through the shop, the majority may look alike, yet each Unit is handled as a *special assignment*. Built right into it, are the specific service characteristics that will deliver the required power with maximum efficiency, economy, durability and minimum maintenance.

Resolved to practical terms, Philadelphia Herringbone Speed Reducers, while made to standard specifications, are produced by master craftsmen to do your job exactly as you want it done.

Write on your Business Letterhead for Catalog H49.

Philadelphia Gear Works, INC.

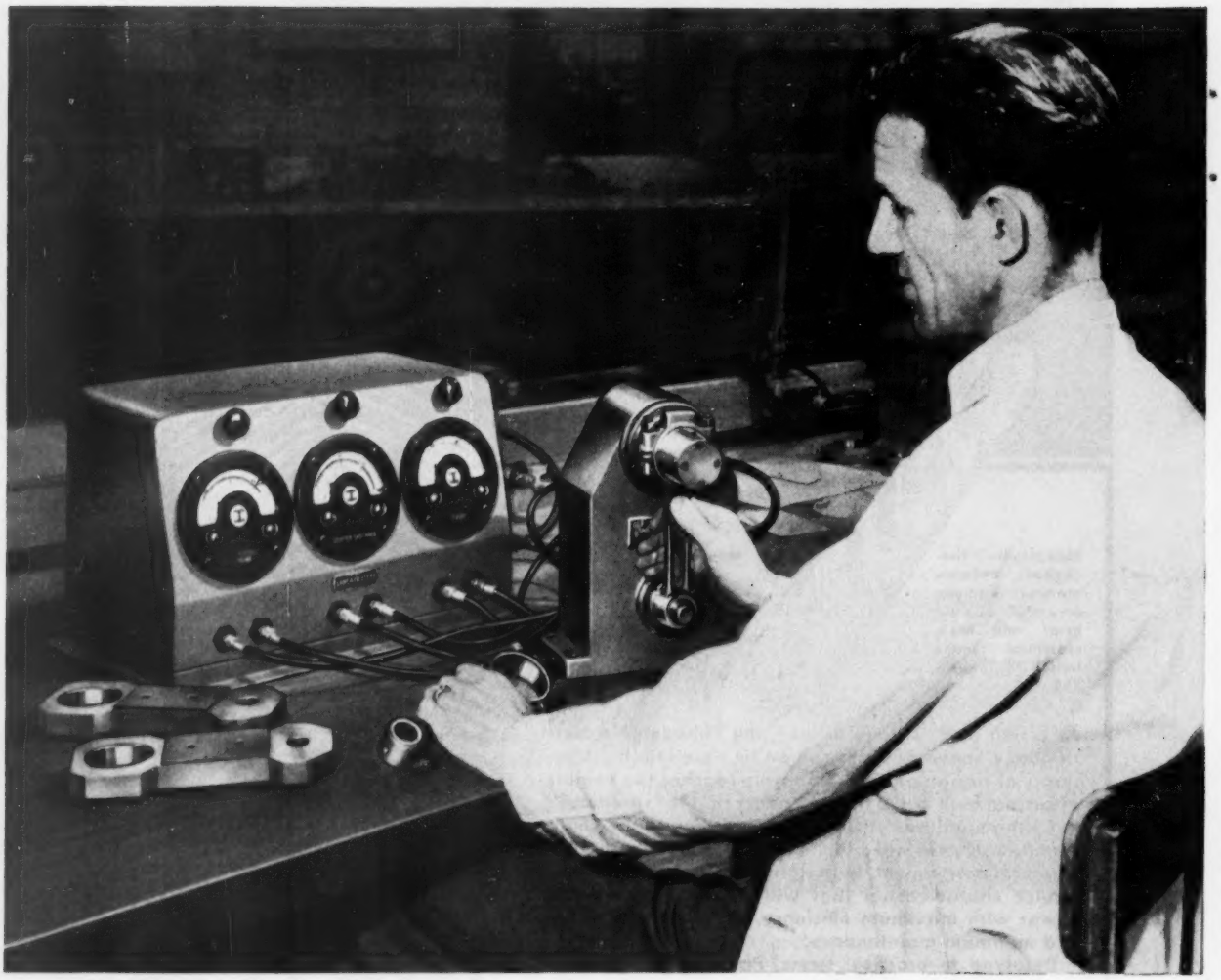


ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Only a Taft-Peirce *Offers these 4*



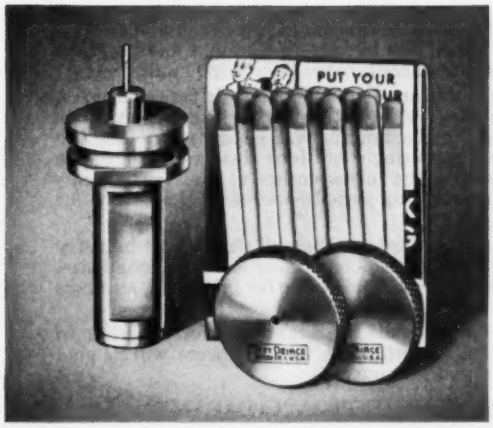
1 Computes Difficult Measurements Automatically

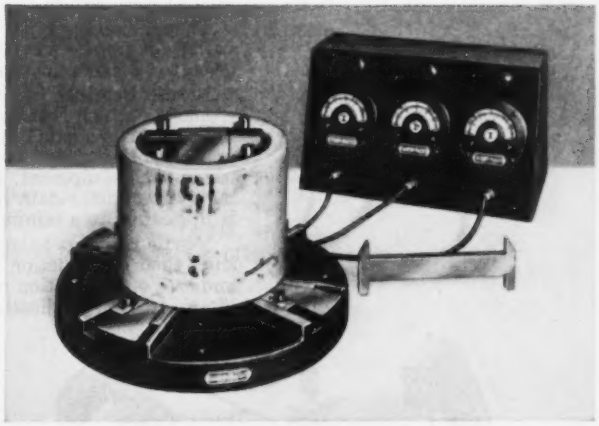
A T-P Computing CompAIRator eliminates the need for two measurements and a calculation. One gage, one dial, measures, calculates and indicates the final answer instantly on the dial face, for such difficult measurements as center distance without respect to hole size, deviation from angle or taper, concentricity, and squareness of bore to face.

The three dial Computing CompAIRator pictured above does the work of six dials in checking bend, twist, and center distance of connecting rods.

THE TAFT-PEIRCE MANUFACTURING

CompAIRator Air Gage
Great Features



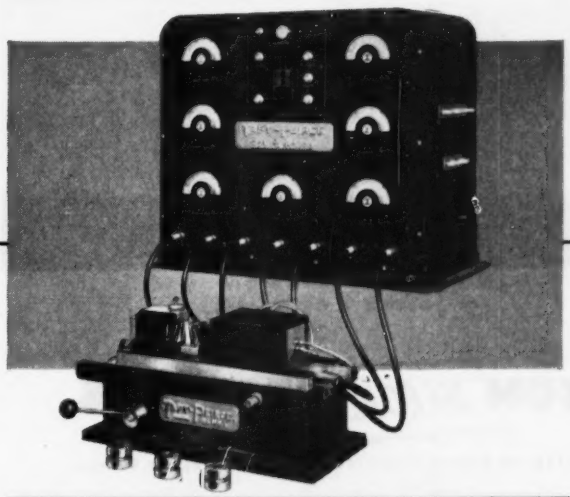


2 Checks Diameters as small as .055″

The velocity-type circuit of a T-P CompAIRator, which permits use of tiny air passages and nozzles, makes these small measurements possible quickly and accurately.

3 Checks Tolerances up to 120 thousandths

T-P CompAIRator air-contact members can be furnished to permit measurements within this wider tolerance range with a standard unit.



4 Gives Simultaneous Signal Light and Dial Indications

A T-P Air-Electric CompAIRator offers the ultimate in speed for multi-dimensional gaging. It provides both exact size on standard dials *and* light indications for oversize, undersize, and within tolerance conditions.

Couple these great features with the greater speed, accuracy, and dependability of a T-P CompAIRator — and you know why thousands use and prefer them. Write for demonstration at your plant. Prove the time and money saving differences for yourself.

T-P means Top Precision

COMPANY, WOONSOCKET, RHODE ISLAND

(For more information on products advertised, use Inquiry Card page 245)

Are retained lubrication and long bearing life vital?

here's how leading harvesting machine manufacturers secure them with NEEDLE BEARINGS

Torrington Needle Bearings are important design features on many harvesting machines because of their unique ability to retain lubricants, and because of their long service life.

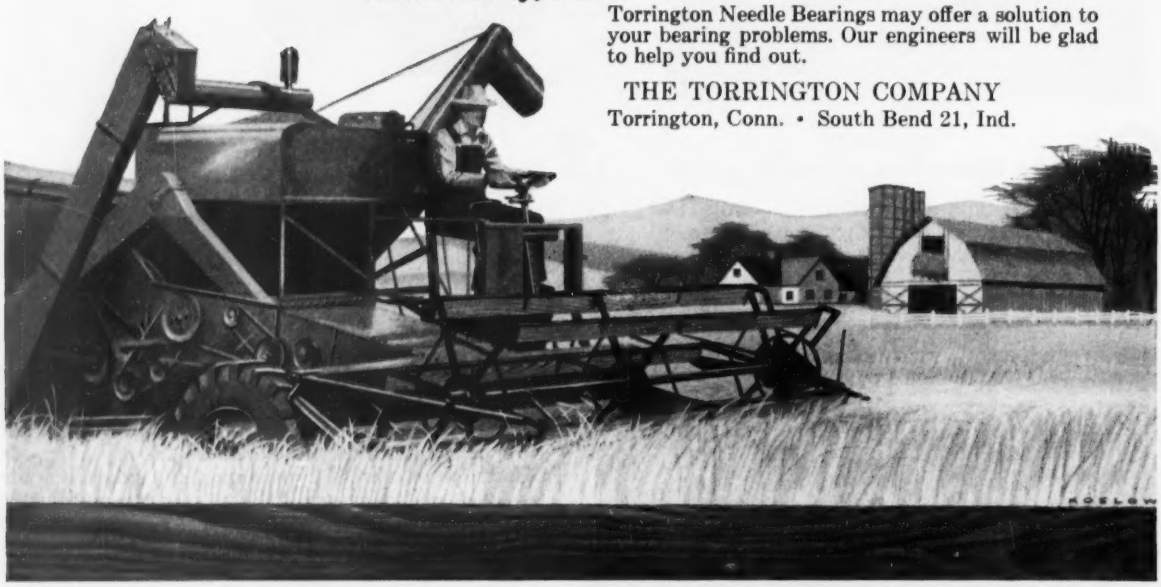
They have been *performance-proved* in machines which handle a wide variety of crops, on every type of soil and terrain—including combines, corn or cotton pickers, mowers and other miscellaneous harvesting equipment.

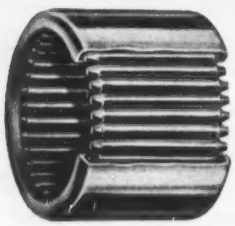
Needle Bearings in such machines are found in main drives, gearboxes, crankshafts, bell cranks, idler pulleys, sprockets, steering gears and various linkages. The small but rugged Needle Bearing has capacity for long life under punishing loads and severe operating conditions always present in the use of such equipment. Furthermore, the turned-in lips of the Needle Bearing's outer shell retain lubricants for long periods—reducing down time for relubrication to a minimum.

Needle Bearings have become "standard equipment" throughout industry since their introduction nearly twenty years ago. Their low cost, small size, and ease of installation make them the natural choice for increasing numbers of anti-friction applications.

Torrington Needle Bearings may offer a solution to your bearing problems. Our engineers will be glad to help you find out.

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.





TORRINGTON NEEDLE BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

Trade-marks of leading manufacturers of harvesting equipment who use Needle Bearings.

AC · Kingham Universal · Oliver · GEHL · Fox · International Harvester · John Deere Quality Farm Equipment · New Idea Farm Equipment · Gleaner · Ford · New Holland · Case

(For more information on products advertised, use Inquiry Card page 245)

Conomatics demonstrate carbide tools

We believe you know that not every "automatic" job can be tooled successfully with 100% carbide. What we think you may not know is that the Conomatic Carbide Development program is making progress with such jobs. This relatively new Cone service is convincing to those who like to be shown that "it can be done".

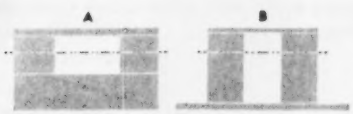
Granted that experimental runs are not production runs, it has often been proved that under actual production conditions they have developed into production runs. A number of conditions must be met in the successful use of any tooling material. Carbide is no exception. If the comparisons of 100% carbide and HSS runs indicate as much gain as per the job illustrated, the reward is worth the effort.

For full particulars please consult your Cone Representative or inquire direct.

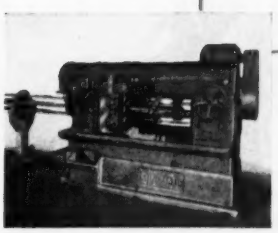


MATERIAL—EVERDURE: (96% copper, 3% silicon, 1% manganese) Hole drilled with 17/32" drill to 1½" depth; thread rolling of ½" pipe thread.

	HSS	CARBIDE
Cycle Time	35 secs.	15 secs.
Work Spindle Speed	420 R.P.M. at 124 S.F.	850 R.P.M. at 250 S.F.
Tool Wear	2000 pcs. per grind	5000 pcs. per grind



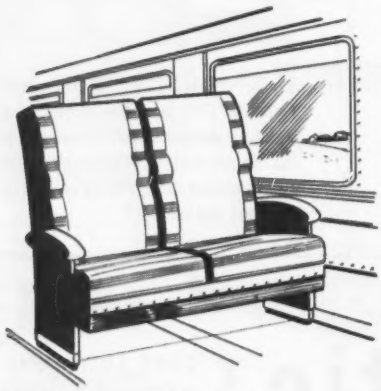
The CONOMATIC is the ONLY representative of Frame "A". The short, "weave-proof," upright members, secured between larger and heavier top bed and base, make possible the strongest type of bridged support to the tooling area and its "work and tool axis."



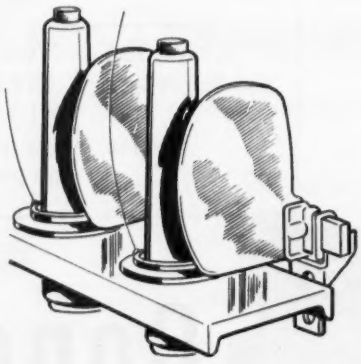
Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

(For more information on products advertised, use Inquiry Card page 245)

UNBRAKO BUTTON HEAD SOCKET SCREWS feature the following: threads to head; low head height; nonslip drive; hex socket that minimizes possibility of marred or mutilated heads; Class 3 fit; heat treated alloy steel; standard sizes from # 8 through ⅝" diameter.



USE UNBRAKO BUTTON HEAD SCREWS on transportation equipment—door and window frames, paneling, seats.



On textile machinery—slashers, twisters, bobbin shields.

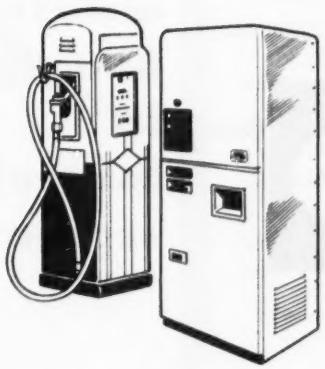


Have you checked our UNBRAKO standards?

We suggest you do, because a standard UNBRAKO delivered from your distributor's stock means faster and better service. A standard will do the job as well as a special at much lower cost. For details about UNBRAKO Standards, write STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

UNBRAKO® SOCKET SCREW DIVISION

SPS
JENKINTOWN PENNSYLVANIA



On sheet metal assemblies—coolers, gasoline pumps.



UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

(For more information on products advertised, use Inquiry Card page 245)

MADISON-KIPP *Fresh Oil*

. . . FED UNDER PRESSURE
BY THE MEASURED DROP



the most dependable method of lubrication ever developed!

This lubricator becomes an integral part of a machine tool in which there are 48 vital bearings that require dependable lubrication. The Madison-Kipp mechanism is so compact that the reservoir measurements are only 4" wide, 19¾" long by 5¾ high."

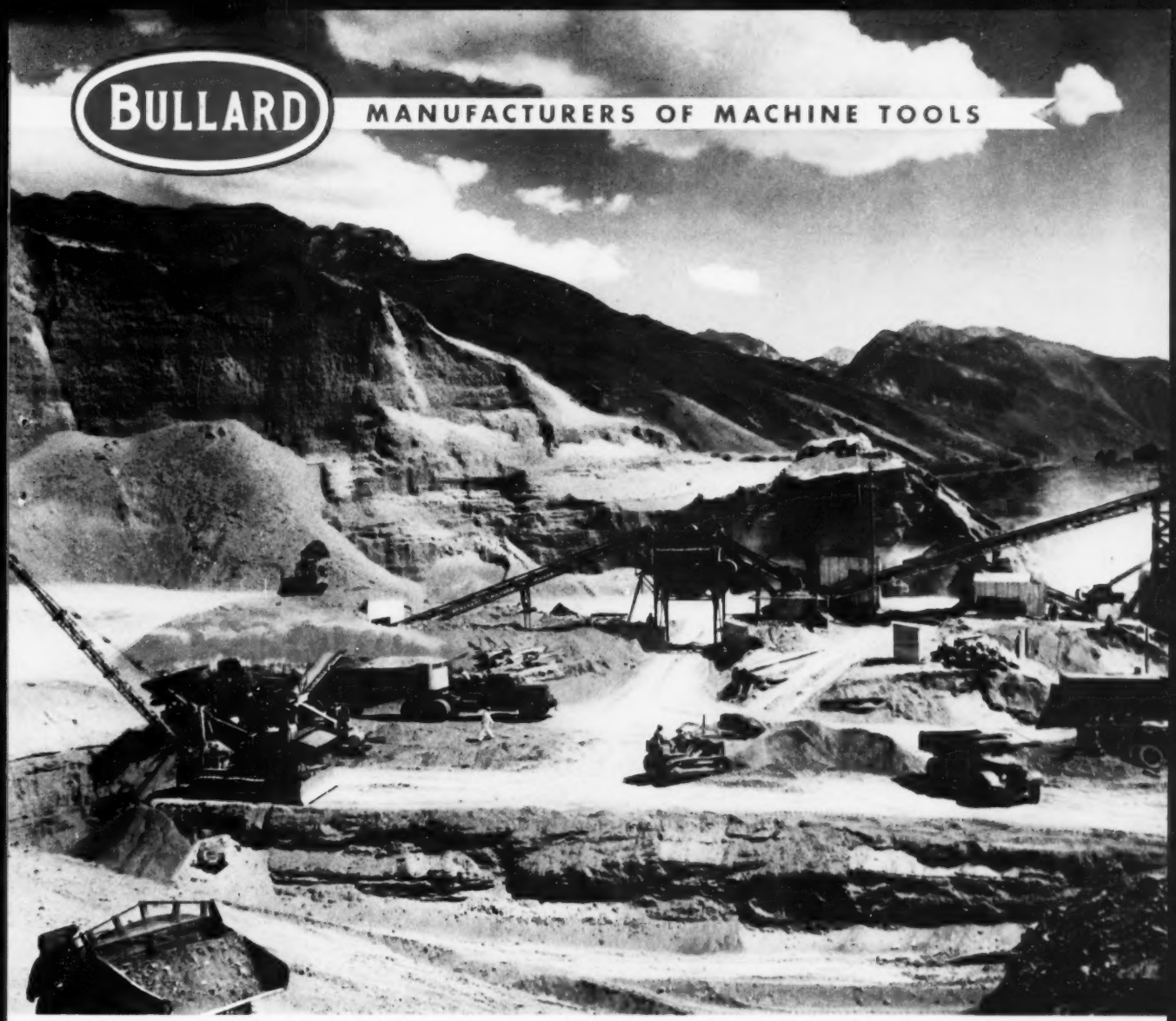
There are six different models to meet almost every application requirement. Please write us for all details regarding your particular lubricator requirements.

MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WISCONSIN

kipp

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

(For more information on products advertised, use Inquiry Card page 245)



Operation of Huge Gravel Pit — Salt Lake City, Utah

Caterpillar Tractor Co. Photo

The Invisible Background of Industrial Progress

So common a sight is the well-known gravel pit that little importance is attached to the fact that it is one of the important natural resources essential to the building of highways, other grading projects, concrete structures, buildings, huge dams and bridges, dykes for flood control and flooded land reclamation.

In each of these and many other uses the competitive low cost handling from the gravel pit to the end use is dependent upon modern equipment — digging, transportation, grading, mixing or final placement. Such equipment is basically a product of manufacturing processes ★ dependent upon *Modern Machine Tools.*

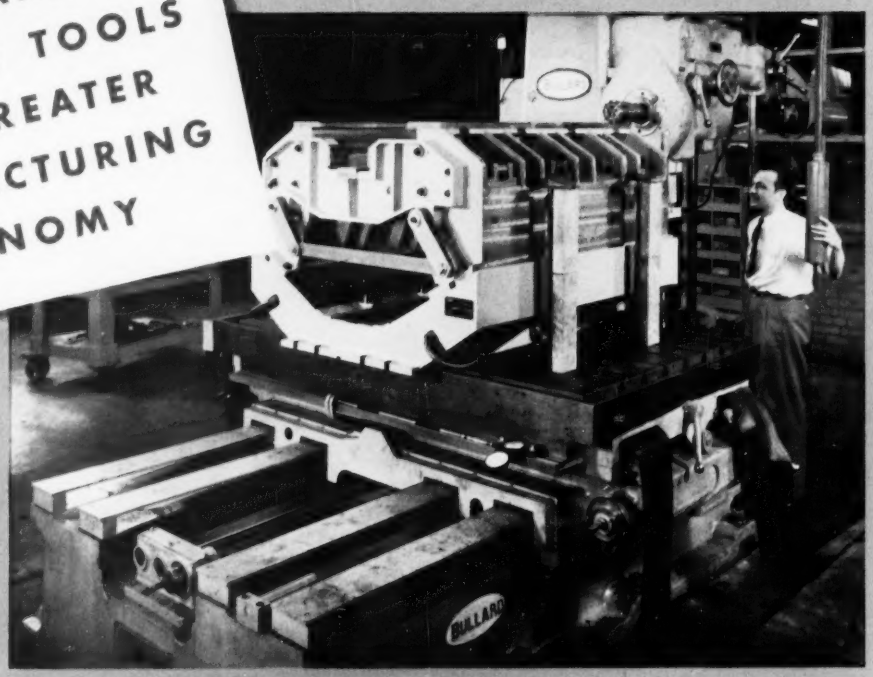
Bullard has had years of experience in efficiently servicing the needs of producers of essential equipment which meet the growing economic needs of "The Invisible Background of Industrial Progress."

★ *For greater manufacturing economy REFER to next page.*

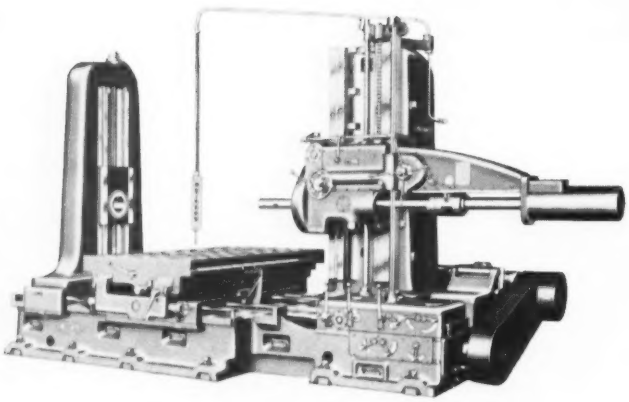
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



For diversified performance plus utility, The Bullard Boring, Milling and Drilling Machine offers maximum accuracy and efficiency.



The 4-Way Bed on the Bullard 4 inch and 5 inch spindle Horizontal Boring, Milling and Drilling Machines provides rigid support for the table, permitting heavier work loads with a higher degree of repetitive accuracy.

These machines, built to exact standards of quality, have great productive ability and maintain a high degree of accuracy to meet any customer requirement, thereby reducing manufacturing costs.

Ask a Bullard engineer to explain the many features of this versatile and reliable machine — you'll be glad you did.

BULLARD

Time saved is money earned. Write now for information on Bullard Horizontal Boring Machines.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT





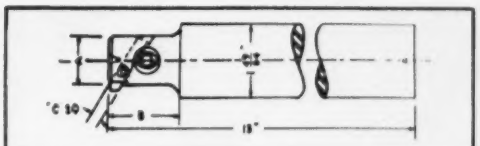
Why wait for delivery on precision boring tools?

Get immediate delivery of Davis stub boring tools with unfinished shanks and finish them in your own shop

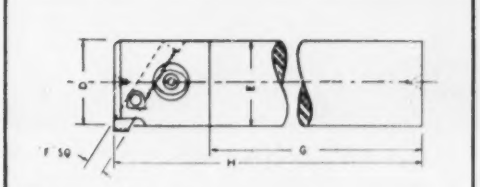
It's fast. It's inexpensive. It's practical. In a matter of hours your order is shipped from stock. Without costly delays, you have high precision boring tools for any job requiring 1¼ to 7 in. bore diameter.

Properly centered and prepared for turning, these Davis tools are designed for use with high speed steel, super high speed steel, or tungsten carbide tipped cutters. They are the same high quality tools — heat-treated 4150 alloy steel Rockwell "C" 28.32—as Davis finished shank tools.

Get in touch with your Davis representative or write for Bulletin DB-110 for complete information.



Tool No.	A	B	C	Boring Range
123	1"	1½"	¼"	1¼" To 1½" Dia.
121	1¼"	2"	5/16"	1½" To 2" Dia.



Tool No.	D	E	F	G	H	Boring Range
118	1¾"		⅞"	12¼"	14¼"	2" To 2⅝" Dia.
116	2¼"	"D"	1⅓"	14½"	17"	2⅞" To 3¼" Dia.
114	2¾"	Plus	⅝"	16"	19"	3⅛" To 4⅛" Dia.
111	3½"	1/64"	¾"	8½"	12"	4⅛" To 5¼" Dia.
107	4½"		1"	7"	12½"	5½" To 7" Dia.



If Davis can't bore it — it can't be done

DAVIS BORING TOOL DIVISION

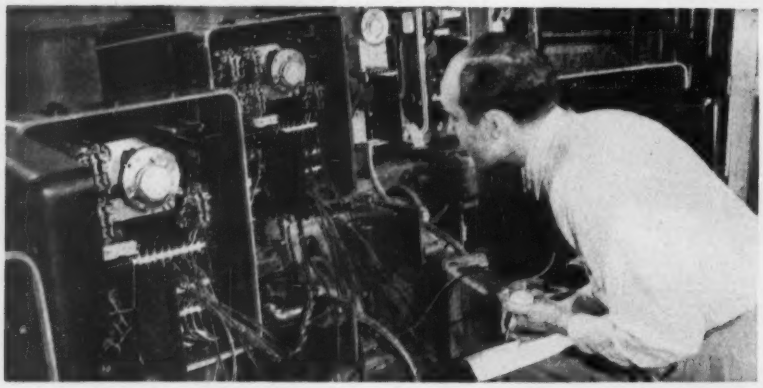
GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN

Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

(For more information on products advertised, use Inquiry Card page 245)

Wide Adaptability, Control Efficiency Result in . . .

NEW APPLICATIONS FOR G-E PROCESS TIMERS



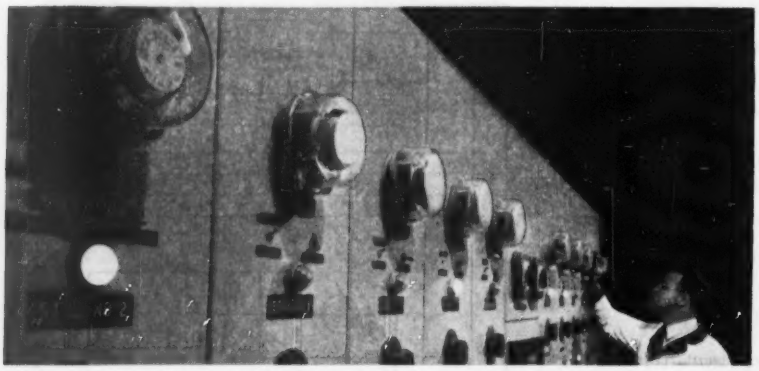


WIDE ADAPTABILITY! Originally designed for ventilating equipment, the General Electric TSA-14 process timer is now being used on many new applications. For instance, one company (left) uses it for valve control on water softeners. Color codes make quick, easy work of installation.





CONTROL EFFICIENCY CUTS COSTS! Because lubrication is automatically controlled by a G-E TSA-14 timer, this operator's output is increased, machine life prolonged, shut-down time minimized. The weather-proof, die-cast base and glass cover allow installation indoors or out.





FOR ANY APPLICATION, whether on chemical processing (above) or machinery control, the G-E automatic TSA-14 timer can save valuable man-hours, reduce costs, increase production efficiency. For more information write for Bulletin GEC-525, to General Electric Company, Schenectady 5, N.Y.

603-166

GENERAL ELECTRIC

(For more information on products advertised, use Inquiry Card page 245)

"STANDARD for tough jobs since 1881"





Red Shield says:

Call your Industrial Supply Distributor for Shield Brand Reamers.

Specialized factory service available everywhere.

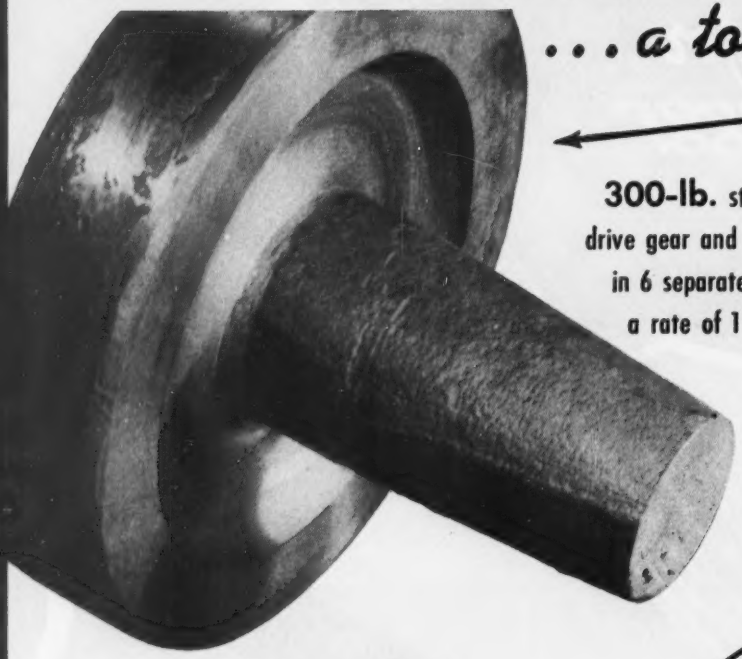
STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

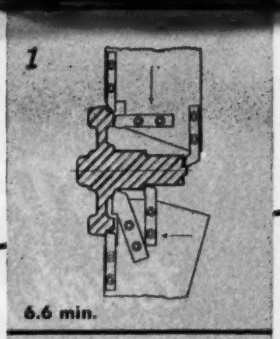
FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

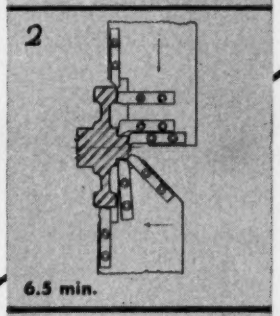
THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

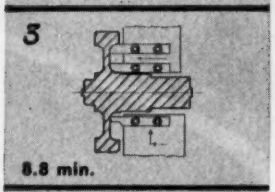
here's A JOB ... a tough one!

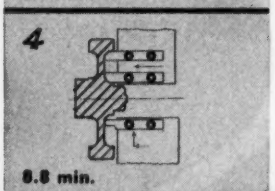


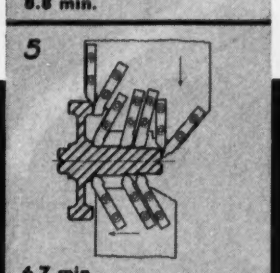
300-lb. steel forging for final drive gear and shaft—machined in 6 separate operations—at a rate of 1 finished piece per hour.

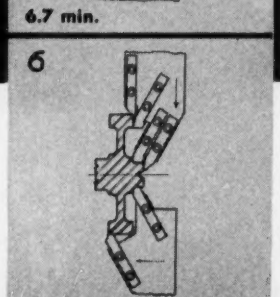




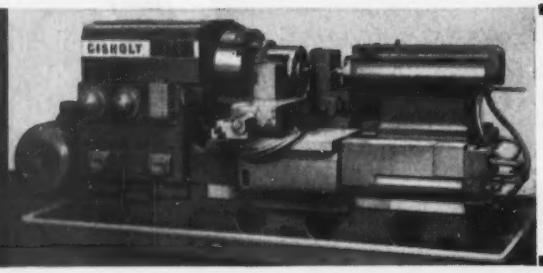








here's THE MACHINE ... that licks it!



GISHOLT
No. 24 Hydraulic Automatic Lathe

Here's how Western Gear Works of Belmont, California, solved their problem:

With two longitudinal carriages and two transverse tool slides, the standard No. 24 machine has the flexibility to combine rapid traverse and feed in several directions. Hydraulic controls make it very simple to change setups.

Now, note how tooling costs were cut by using mounting plates instead of special slotted tool blocks. Large tool bit shanks are slotted, and thus are easily set before final bolting down. The complete riser blocks are quickly interchanged for various operations. And here, again, Gisholt's traditional power and rigidity show up on cuts that pull up to 80 h.p.

For low costs on tough jobs, think first of the Gisholt No. 24 Hydraulic Automatic Lathe. Write for literature.

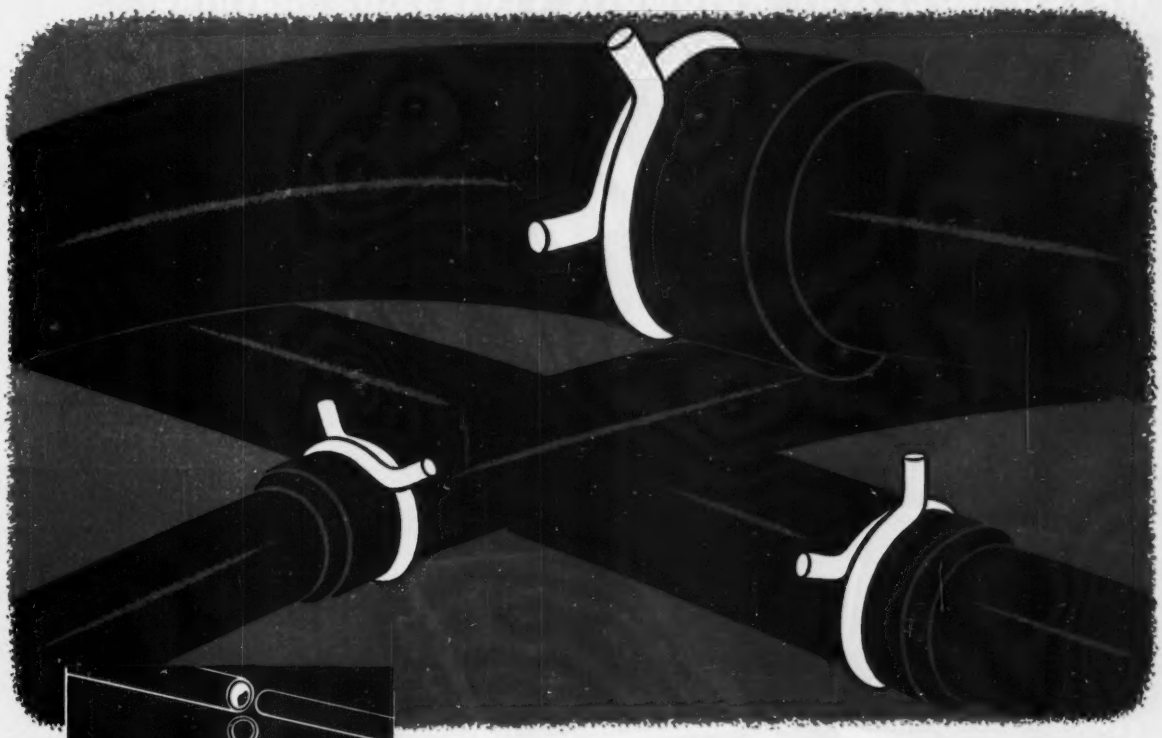
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

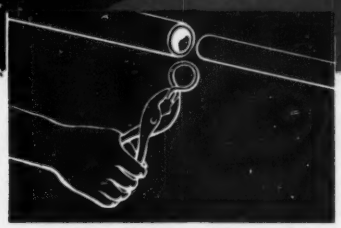
THE GISHOLT ROUND TABLE
represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



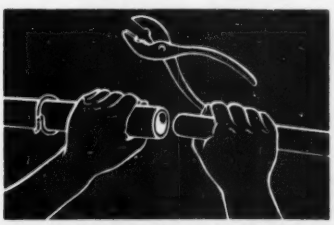
TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

New economies in hose fastenings...

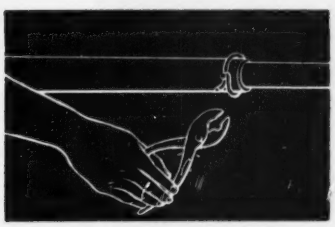




Squeeze clamp open; slide over hose.



Join hose and hose connection.



Position, then release. Seals perfectly!

with Eaton Reliance "HOZ-FAS-NERS"

One look at Reliance's new development in fastening rubber, plastic or fabric hose to hose connections—and you will see a new, profitable yet proven way to cut assembly costs! Although low in unit cost, Reliance Hoz-Fas-Ners provide an exceptionally tight seal through constant tightening action. Manufactured from special spring steel and factory coated with a rust-proof finish, Reliance Hoz-Fas-Ners reduce assembly operations to the 3 easy steps illustrated at left. In actual use, Reliance Hoz-Fas-Ners extend hose life by virtue of its rounded surface design which does not exert the cutting action found in conventional hose clamps.

For complete details and sizes available on this new Reliance development, write today for the "Hoz-Fas-Ners" Bulletin . . . or call your nearest Reliance Sales Office.





EATON MANUFACTURING COMPANY

507 CHARLES AVE., S.E.

OFFICE and PLANTS • MASSILLON, OHIO

Springfilm & Semi · Snap & Retaining Rings · Special Steels · Spring Lock Washers · Hoz-Fas-Ners

SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

(For more information on products advertised, use Inquiry Card page 245)

NATCO HOLEWAY Automatic Processing Machine

with

Mobile Hydraulic Power Units*

"And of course they comply 100% to J.I.C. Standards"



* NATCO mobile hydraulic power units mean (1) speedy replacement, keeping down time to minimum (2) accessibility for adjustment or repair (3) lower maintenance cost (4) continuous production

Completes 102 operations automatically on each engine block



production-100 parts per hour

OPERATION DETAIL AS FOLLOWS:

Station 1—Load

Station 2—L. H. Head; Combination core drill and counterbore cam hole in rear wall
R. H. Head; Core Drill cam hole in front wall

Station 3—L. H. Head; Drill 6 holes
R. H. Head; Drill 6 holes

Station 4—Idle

Station 5—Idle

Station 6—L. H. Head; Drill 9 holes
R. H. Head; Drill 16 holes

Station 7—L. H. Head; Drill 2 holes
R. H. Head; Drill 2 holes

Station 8—Idle

Station 9—L. H. Head; Drill 2 holes, Chamfer 7 holes
R. H. Head; Chamfer 16 holes

Station 10—L. H. Head; Drill 2 holes
R. H. Head; Drill 2 holes, Chamfer 4 holes

Station 11—Idle

Station 12—L. H. Head; Drill 2 holes, Chamfer 3 holes
R. H. Head; Drill 2 holes

Station 13—L. H. Head; Drill 2 holes
R. H. Head; Drill 2 holes

Station 14—Idle

Station 15—L. H. Head; Combination ream and chamfer 2 holes, Ream 2 holes, Semi-finish ream 2 holes
R. H. Head; Drill 2 holes

Station 16—L. H. Head; Combination ream and counterbore 1 hole
R. H. Head; Trepan 2 holes, Ream 2 holes

Station 17—Remove part



Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices 1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

(For more information on products advertised, use Inquiry Card page 245)



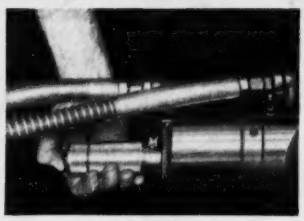
ACTION PICTURE
of how to save money by riveting!

This action photo, taken on the frame assembly line in one of the largest auto factories, illustrates how cost-conscious manufacturers save money with Hannifin "Hy-Power" Hydraulic Riveters.

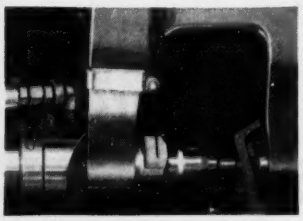
First step in assembly is to rivet the frame together... with Hannifin "Hy-Power" Riveters. The light-weight forged C-Frames hang from balancers within easy reach of each operator. No special skill is required to head the ⅜" rivets, cold, each in seconds. What's more, this "silent squeeze" method forms stronger, more uniform rivets, hot or cold.

Power source is the Hannifin "Hy-Power" Hydraulic Pressure Generator which quietly supplies pressure to the "Hy-Power" Cylinder that does the work. These riveters are available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities.

here's the HANNIFIN "HY-POWER" WORK CYCLE



In position. A single control button starts (or interrupts) the automatic Hy-Power cycle.



Ram approaches fast, then hydraulic pressure automatically intensifies, and the rivet head is formed.



Fast, automatic return. Total elapsed time to head a rivet is only 2 to 3 seconds.

"HY-POWER" CAN ALSO BE USED IN MULTIPLE TO SET SEVERAL RIVETS

Bulletin 150 tells how to save money on riveting, staking, punching, forming and bending operations. Write for copy.



do ALL you can do... with

HANNIFIN

Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

(For more information on products advertised, use Inquiry Card page 245)

When you look into Double Diamonds **THREE FACTS** stand out...



May we send you a copy of this comprehensive catalog on the ten gear types in which we specialize?

AUTOMOTIVE GEAR WORKS, INC.

RICHMOND, INDIANA

DOUBLE DIAMOND GEARS

FOR FARM EQUIPMENT, AUTOMOTIVE & GENERAL INDUSTRIAL APPLICATIONS

THEY CAN TAKE IT...and DO!
...and still maintain accuracy

STANDARD *Dial Indicators*

Built to stand the knocks—often unavoidable

NEW - with Years of Service Ahead



REGULAR AGD SERIES

AGD SPECIFICATIONS THROUGHOUT

Made in 22 models including 4 dial diameters, 7 different graduations. Also 90° models (stem perpendicular to back). Long Range and Long Stem types.



Decimatic SERIES

AGD SPECIFICATIONS except Range and Marking

For especially fine checking, extra high repeatability and accuracy. Marked in decimals. No whip of hand. 16 models.

This One Was New... *Years Ago* - Still Serviceable

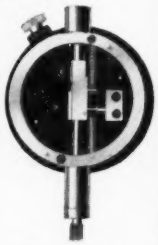


Obviously it has withstood hard usage, yet indicators such as these are constantly being reconditioned (at a fraction of the original cost) — to return still more dependable service to the owner.

You wouldn't treat your watch the way some indicators have to be treated. Standard Dial Indicators are built to give continuing accuracy while standing the knocks.

Outstanding Reason for the Durability Built into Standard Indicators is the

SHOCKPROOF MECHANISM



Proved by experience to prolong instrument life greatly, Standard's Shockproof Mechanism protects internal parts right from the spindle on. Furnished regularly in most models, not treated as an optional extra. Standard Indicators give longer, trouble-free life, need fewer repairs, are dependable. These facts add up to "Greater Economy."

STANDARD GAGE CO., Inc., *Poughkeepsie, N.Y.*

(For more information on products advertised, use Inquiry Card page 245)







How Stewart-Warner Minimizes the Weight of Opinion in Machinery Replacement

"Employment of the MAPI formula, in conjunction with our present system of methods engineering, has resulted in the application of factual information in arriving at decisions, instead of reliance on opinions which were too frequently predicated on empirical knowledge.

"Today, all recommendations or requests for machinery acquisitions are subjected to the various considerations suggested by the MAPI formula; we have a planned machinery replacement program which calls for orderly, economically sound replacements, as well as new acquisitions, — justified by objective and searching data, with the weight of mere opinion minimized.

"In many instances the formula has served to bring the necessity of a purchase or replacement into sharp focus; it has revealed opportunities for savings and efficiencies not realized until MAPI data has been marshalled and evaluated.

"We believe that the MAPI formula has been a real improvement over former methods, and that its effectiveness will increase as data required for its application becomes more available."

D. C. PETERSON, *Vice-President and Director of Engineering and Manufacturing of Division One of*
STEWART-WARNER CORPORATION
Chicago, Illinois

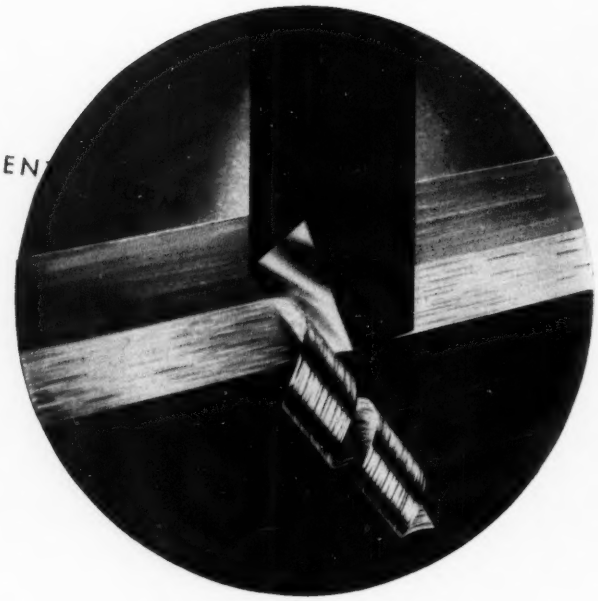
ROCKFORD INSERT GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

October, 1953

hydraulic drive . . . a natural for

CHECK-POINT OF MAXIMUM INVESTMENT



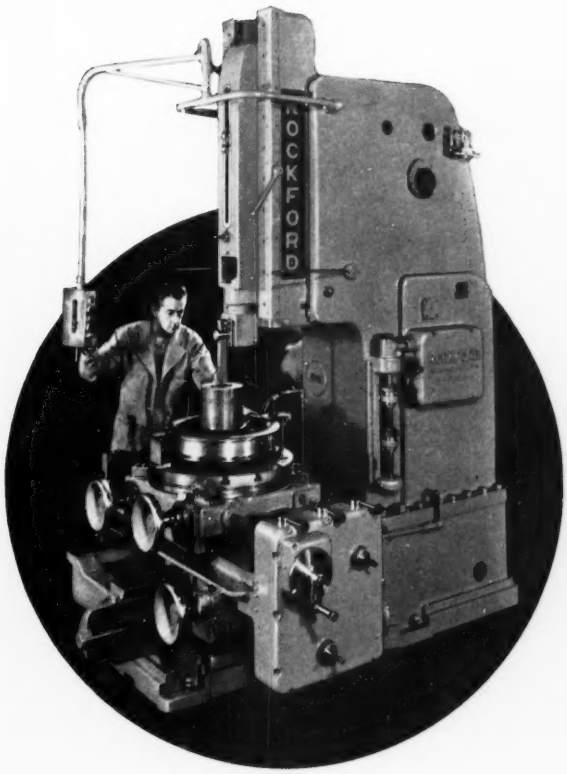
Rockford Machine Tool Co.

MADE IN
ROCKFORD... TESTED ENGINEERING AND CRAFTSMANSHIP
ILLINOIS, U.S.A.



Machinery, October, 1953

reciprocating machine tools



Hydraulic Drive and Feeds, as basic features in modern machine tool design, provide outstanding performance, measured in terms of work quality, high production and low operating cost.
We have had over 25 years of experience in applying Hydraulic Drives and Feeds to Shapers, Planers and Slotters.

rockford hydraulic slotters

Powerful Hydraulic Fulcrum Drive to Ram
10° Tilt to Ram
Swiveling Tool Head
Pendant Controlled Cutting Speed Changes, infinitely variable.
Hydraulic Feeds in all Directions
Power Rapid Traverse in all Directions
Stroke Length Adjustment when Ram is in motion.
Dividing Head, Standard Equipment
Optional—Traveling Column for Greater Capacity

shaping / planing / duplicating / turning

our 51st year

Rockford, Illinois



MADE IN

FOR PRODUCTION MACHINE TOOLS IT'S...**ROCKFORD**

ILLINOIS, U.S.A.

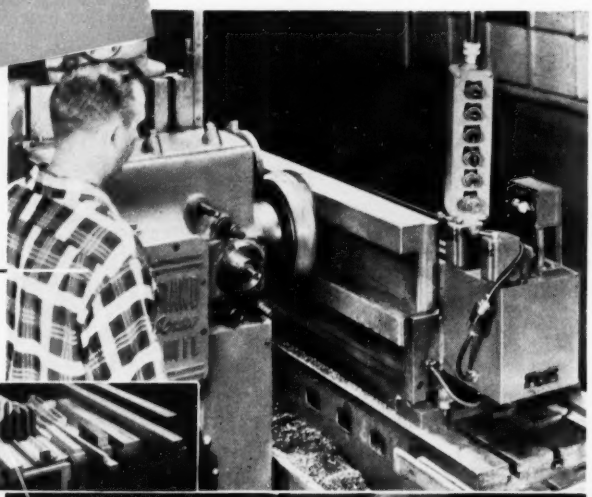
Get Profitable Methods *plus* Advanced Machine Design

from . . .

SUNDSTRAND "Engineered Production" Service

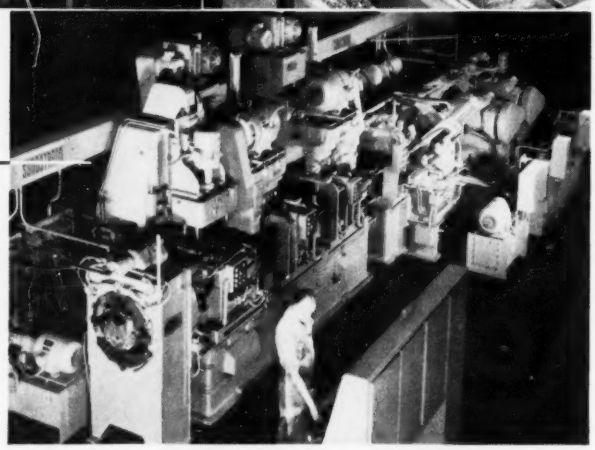
Here are some representative examples of machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, have resulted in many cost-saving Sundstrand installations. If you have metal working operations in your plant and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.

Small Lot Milling with Fast Magnetic Clamping



Sundstrand Model 33 Rigidmil equipped with a Sundstrand Magnetic Fixture. Parts machined include tool blocks, cam bars, tool slides, motor brackets, etc. Lot sizes vary from 1 to 25 pieces, and time reduction averages 50% over former method. In addition to saving time through the elimination of mechanical clamps, these magnetic fixtures save the costs of special jigs or fixtures.

Multi-Station Automatic Transfer Rigidmil



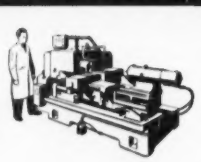
Here is an interesting example of Sundstrand "Engineered Production" as applied to interlocking several machine elements into continuous flow production. It is a Sundstrand special purpose 9 station transfer or process type machine designed and built to drill and ream locating holes, mill bearing sides and odd pads on cylinder blocks. Controls are operated from a floor mounted console type control station and are designed to cycle the complete unit individually or provide complete interlocking of the cycle with several other machines. Production is 80 pieces per hour.

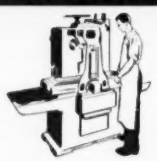
SUNDSTRAND

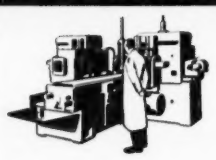
*"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







MADE IN ROCKFORD... FOR ACCURATE, FAST METAL REMOVAL

ILLINOIS, U.S.A.

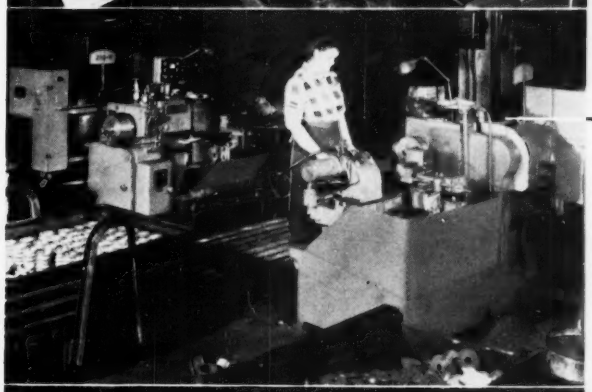




Hopper Loading for Production Turning

This Sundstrand Model 8A Automatic Lathe turns and chamfers three different lengths and diameters of master track link pins. Operator loads parts into a hopper loader and automatic machine cycle is started with chucking of part.

When machine cycle is completed and the front slide has returned to the starting position, a work ejector pushes the pins out of the chuck and into the unloading vee. Machine will run automatically with one filling of the hopper for approximately 10 minutes.



Small Lot Turning

Illustration at left shows two of a battery of Sundstrand Automatic Lathes that increase production better than 2 to 1 over former method. Lot sizes, for the many different parts run over these machines, vary from 150 to 200 pieces. Parts are of cast iron and steel and are used in production of heavy machinery. The units in this battery of Automatic Lathes are installed with facing fronts, as shown in the above illustration. Because of the simplicity of operation, one operator can easily run two machines.



Multi-Station Automatic Indexing Machine

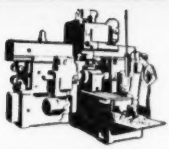
Special Sundstrand Five Station Process Machine for milling port faces and angle pads, drilling port faces and counter-boring angle pad of manifold part. This irregularly shaped part is located and clamped at station #1 and then indexed thru the remaining four work stations to complete the machining with one handling of the workpiece. Production is approximately 115 pieces per hour.

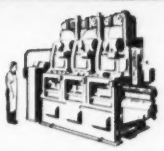


FREE DATA

Additional information on the complete line of Sundstrand machines is available. Ask for bulletin 636

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.



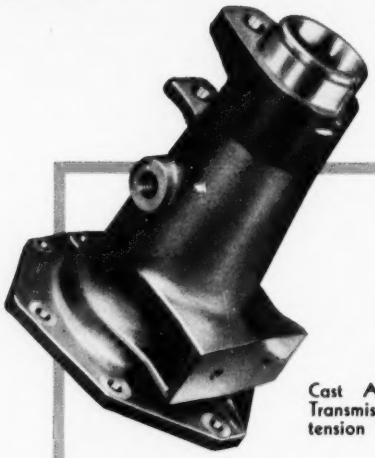
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN... **ROCKFORD**

MADE IN
ILLINOIS, U.S.A.

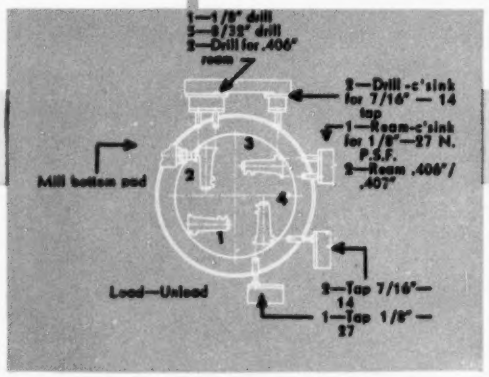
118 *Pieces per hour* 35 *Operations....*

TRANSMISSION EXTENSIONS MACHINED TO CLOSE TOLERANCES ON COMPANION UNITS

Here is another typical example of how W. F. & John Barnes coordinated special machine engineering and building service helps solve complex machining problems. These two companion units, designed to machine cast aluminum automobile transmission extension housings, reduce production costs by combining operations. Note how the parts are positioned and the tooling arranged for efficient machining, and how the over-all design conserves floor space. The two machines perform 35 operations at the required gross production rate of 118 pieces per hour. Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



Cast Aluminum Transmission Extension Housing



Barnes 4-Station Special Machine with 48" diameter hydraulically operated rotating table. This unit performs 17 operations. Vertical milling of bottom pad in Station No. 2 is completed with a retracting spindle. Fixtures locate part on end bores.

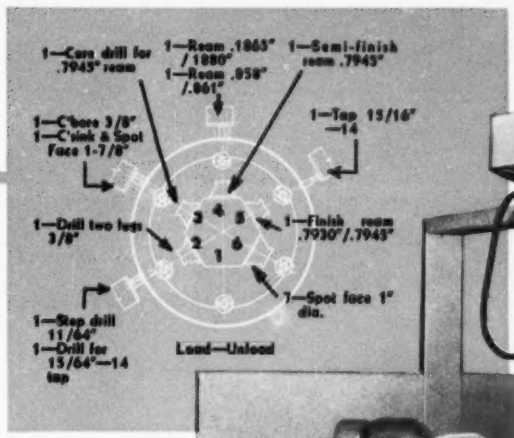
W. F. & JOHN BARNES COMPANY

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

MADE IN
ROCKFORD...MACHINE TOOL SHOPPING CENTER
ILLINOIS, U.S.A.



. . . ON W. F. & JOHN BARNES SPECIAL MACHINES



▶ Barnes 6-Station Center Column Machine, with 72" diameter indexing table, completes 18 operations. On this unit the work-piece is located from the shoulder opposite the flange end, and positioned radially from a reamed hole in the flange.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES

1 **SPECIALIZED MANUFACTURING FACILITIES**—75-year background, large well equipped plant efficiently tooled to produce high production machines.

2 **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.

3 **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.

4 **SPECIAL GAUGES, FIXTURES, TOOLS** — designed for each individual machining problem, assure accuracy of operations at high production speeds.

5 **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.

6 **COORDINATED DESIGN AND ENGINEERING** Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.



Write **FOR FREE DATA**

"Coordinated Machine Engineering" — a free booklet describing modern machines and mass production techniques. Write for your copy today.

310 S. WATER ST., ROCKFORD, ILLINOIS

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



MADE IN

ROCKFORD MADE MEANS PRECISION MADE...ROCKFORD

ILLINOIS, U.S.A.



Mattison Grinder beats old time (15 hours) by 12 hours

The picture above shows a punch and die grinding operation on a Mattison High-Powered Precision Surface Grinder at Lyon Metal Products, Incorporated. Previous time on a converted planer-grinder was 15 hours — now with a Mattison Grinder equipped with special fixture. grinding time has been reduced to 3 hours.

Mattison Grinders are proving profitable investments in plants where "time out" for reconditioning is a vital factor in meeting production schedules. Surfaces are reconditioned and edges sharpened in a minimum of time, eliminating costly delays and holdup of production. Many manufacturers installing the Mattison Grinder for reconditioning dies find many other uses for it in grinding flat surfaces where accuracy and fine finish are required. For complete information on the Mattison High-Powered Precision Surface Grinder, send for free copy of our latest circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

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ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS

ILLINOIS, U.S.A.



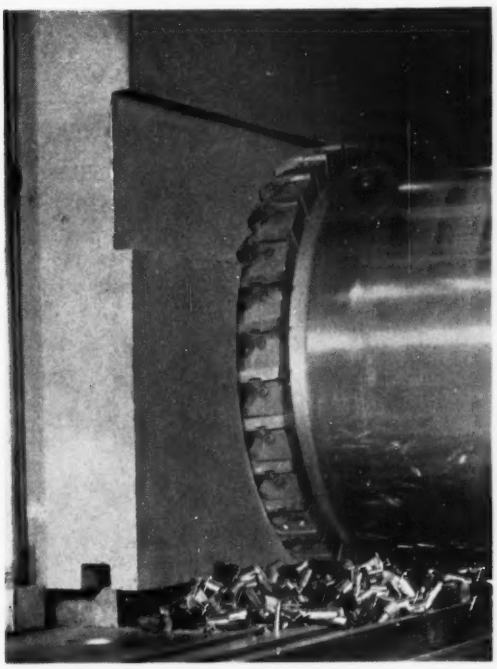
INGERSOLL inserted blade cutters

Milling Tough, Hard Steel

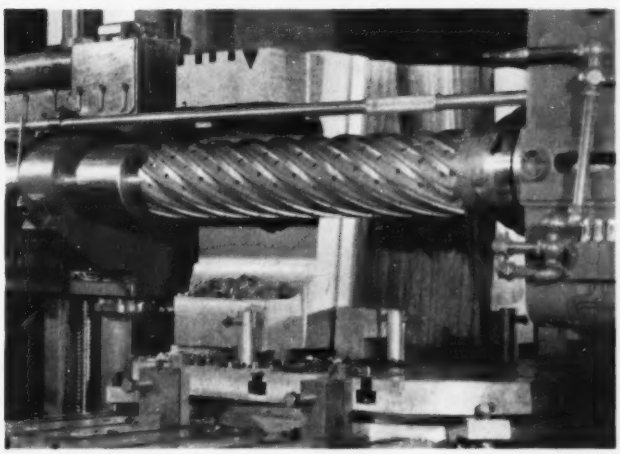
Ingersoll's ability to recommend and build the proper cutters for your work is constantly being strengthened by the experience we acquire on unusual jobs such as those described here. It will pay you to draw upon this experience by consulting our cutter engineers whenever you have a milling or boring problem.



Special Design Ingersoll Shanking Cutter with 18 carbide-tipped blades takes a cut 4-1/2" wide by 1" deep, feeding 2-1/2" per minute, in a 241 Brinell steel die block.



22"-diameter carbide Shear Clear Face Mill takes a cut 3/4" deep by 14" wide in 235 Brinell chrome-moly steel, feeding 8" per minute.



Milling a 4" radius on a forged steel hammer ram head with an 8"-diameter by 42"-long Ingersoll inserted blade Helical Slab Mill.

WRITE FOR INGERSOLL CUTTER CATALOG NO. 60B

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

MANUFACTURERS OF SHEAR CLEAR FACE MILLS

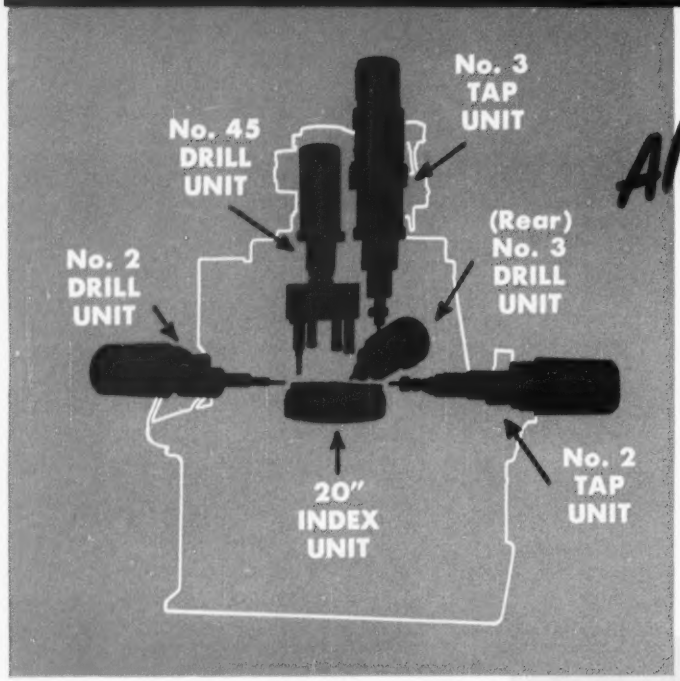


MADE IN

CENTER OF MACHINE TOOL EXCELLENCE... **ROCKFORD**

ILLINOIS, U.S.A.

Rehnberg-Jacobson



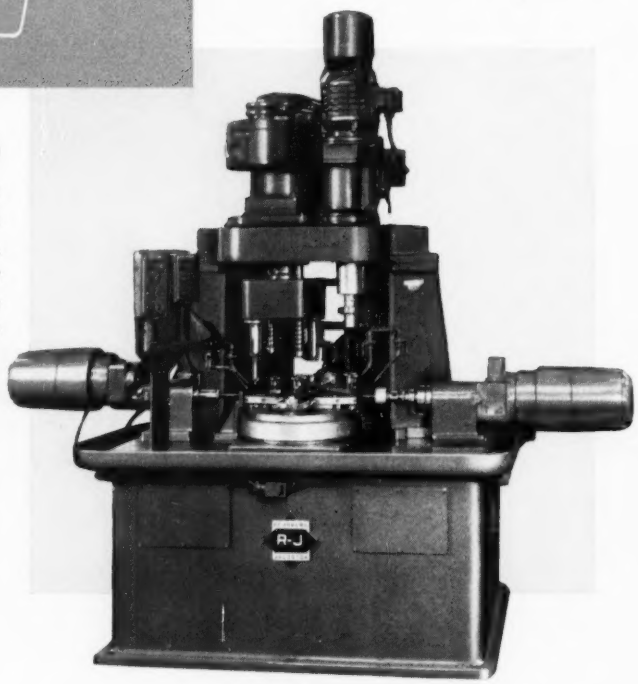
STANDARDIZED *All-Mechanical Units*

PRODUCE VERSATILE MACHINE AT LOW COST

The diagram at the left shows clearly the standardized R-J Units which have been combined to produce the machine shown below. These are ALL-MECHANICAL units — easy to operate, easy to adjust, and easy to understand. R-J Standardized Units are also available separately, for installation as you choose.

CAN YOU COMBINE OPERATIONS?

Have you checked your shop recently, to see if you might combine some operations on a production piece? This machine is a good example: it drills, taps, faces, counterbores, and performs a circular serration operation on a simple little forging. The fixtures have interchangeable adapters for four different sizes of the piece. The feature of the Rehnberg-Jacobson method is simplicity, using standardized units on an uncomplicated structure and employing considerable ingenuity in the arrangement of the machine and design of the fixtures. If you do look around and find where you might use such a machine, let us know so one of our men can drop by to talk it over with you . . .



REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

MADE IN
ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS
ILLINOIS, U.S.A.



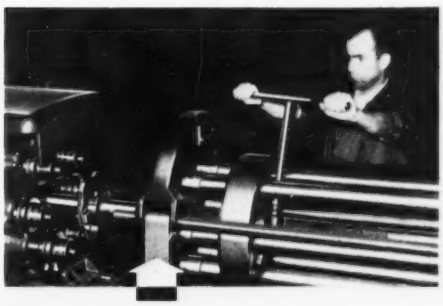
GREENLEE *Automatics*

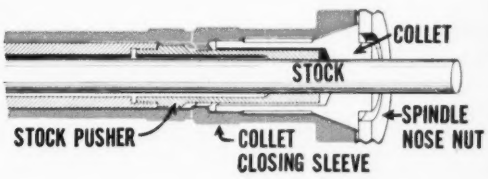


COLLET AND FEED FINGER ARRANGEMENT

REDUCES SET-UP TIME

All six collets and feed fingers can be quickly and easily changed without indexing the spindle carrier. The collets are changed by simply removing the spindle nose nut. Greenlee collets are operated, as illustrated in the drawing, by the action of a sliding sleeve over the taper of the collet. The nose nut holds the collet in a fixed position inside the spindle, thus eliminating any endwise movement. As a result, none is transmitted to the stock, and this provides for accurate stock feed-out.







CHANGING PUSHER TUBES
A few turns of a wrench moves the head of the stock-reel backward to afford the operator plenty of room to change the stock pusher tube assemblies, after releasing and indexing retainer plate.

PRODUCTION MACHINERY
GREENLEE

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GREENLEE BROS. & COMPANY, 1870 MASON AVE., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



MADE IN
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...ROCKFORD
ILLINOIS, U.S.A.

Cut REAMING COSTS

Barber-Colman Precision Reamers

Control Size, Straightness, Roundness and Finish with **Consistent Duplication**



Inserted Blade Reamers

Barber-Colman Inserted Blade Reamers feature low cost blade replacement, easy adjustment for resizing and unusual blade strength for precision high production reaming. Simple pin and wedge design allows more blades per reamer diameter for better, smoother cutting action. Blades are held solidly in perfect diameter, avoiding any possibility for variation in roundness or straightness. Adjustment for resizing is easily and quickly made, with size readily checked across any two blades. Irregular blade spacing provides smooth cutting action and fine finish.

All Styles in HSS or Carbide Tipped



Solid-Fluted Reamers

For small diameter holes, Barber-Colman Solid-Fluted Reamers provide maximum flute strength, quick chip disposal, precision control of roundness and size — and finish that in many cases eliminates lapping. Maximum chip clearance with strongly supported cutting edges provides rigidity and free cutting action for reaming holes to extremely close tolerances. All basic styles and types are included — Precision Jig Boring, Expansion, Taper Reamers, Oil Feed Reamers, Chucking Reamers and Solid Line Reamers.

These features mean better, faster results, with less cost per hole machined. Ask Barber-Colman reamer engineers to assist on your reaming jobs, or send tool and part prints for recommendations.

MADE IN ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION
ILLINOIS, U.S.A.



Custom Built to Fit Special Reaming Problems



Years of experience in testing and designing reamers for maximum performance under a variety of conditions have permitted Barber-Colman engineers to specialize in the manufacture of custom tools to fit special reaming problems. Tools are designed for special conditions of size, finish, tool life, production, or to adapt a reamer to a particular part or machine. Cutting flute profiles, clearance angles or flute design are applied to meet the specific condition.

Reamer Sharpening

Barber-Colman reamers are sharpened by conventional methods on any standard cutter sharpener. For easier sharpening, with positive mechanical duplication of cutting form and clearances, Barber-Colman also offers the Automatic Reamer Sharpener. This semi-automatic method of precision sharpening is particularly desirable for high production reaming applications to assure hole-to-hole consistency.

Get This New Reamer Service Handbook



Complete with Technical Data on Design Factors, Driving and Holding Equipment, Operating Speeds, Feeds and Coolants.

Shows How To Obtain Better Reamer Performance. Guide for Proper Care and Maintenance.

Available without Charge to all Production Executives when Requested On Company Letterhead. Address Barber-Colman Reamers — Dept. 9210.

More than 25 years of practical reaming experience is available without cost when you use Barber-Colman reamers. This experience enables you to get maximum job performance on your specific reaming requirements with low costs per reamed hole. Check your reaming operations and consult with Barber-Colman Engineers.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

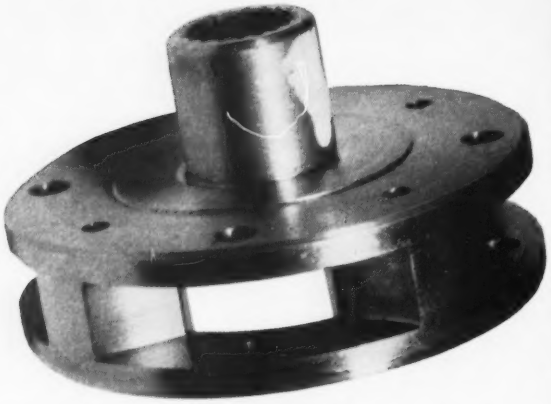
BARBER COLMAN

Barber-Colman Company

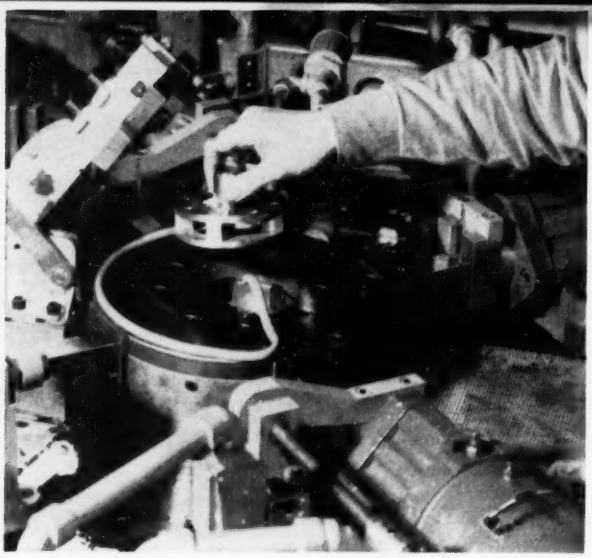
GENERAL OFFICES AND PLANT, 6318 ROCK STREET, ROCKFORD, ILLINOIS



MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.



This is an automotive turbine part. In producing the piece it was found that after milling, one-eighth inch of stock needed to be removed from each end of the four pinion slots in the part (the stock to be removed is shown by the colored area).



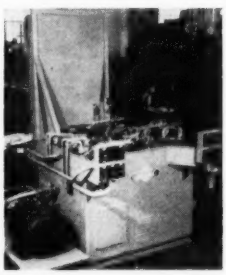
This close-up shows how American engineers attacked the broaching problem. With high production as their goal they devised a machine that would allow all 4 pinion slots to be broached by four radially located reciprocating rams operating in sequence on one fixture.

Special *American* machine helps solve broaching production problem

In nearly every manufacturing operation, sooner or later a metal removing problem occurs that can be solved economically, only by broaching. Usually operations such as these are on high production runs that demand special machines and special techniques. Conventional methods could have been used to remove the small amount of metal required on these automotive turbine parts. But — conventional methods would have greatly reduced production and increased overall time and costs.

American designed a special 4-ton machine to broach the four radial holes of the turbine parts with push broaches. The part is loaded, automatically clamped into place, and then each of the four radially located reciprocating rams working in sequence, push the broaches through the pinion slots and finish the pocket edges. At 100% efficiency the machine can turn out 300 pieces per hour.

Many times production problems such as this one do not require a special machine —but can be handled quite efficiently on a standard American machine. Adapting your problems to American machines is simple work for our engineers. Send us a part-print or sample and your hourly requirements. We'll give you our recommendations with absolutely no obligation on your part.



This is the special machine built by American to solve this broaching problem. We can help you, too. Write us today for information on your particular problem or send for Catalog 300. It illustrates and describes standard American machines.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

MADE IN

ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT

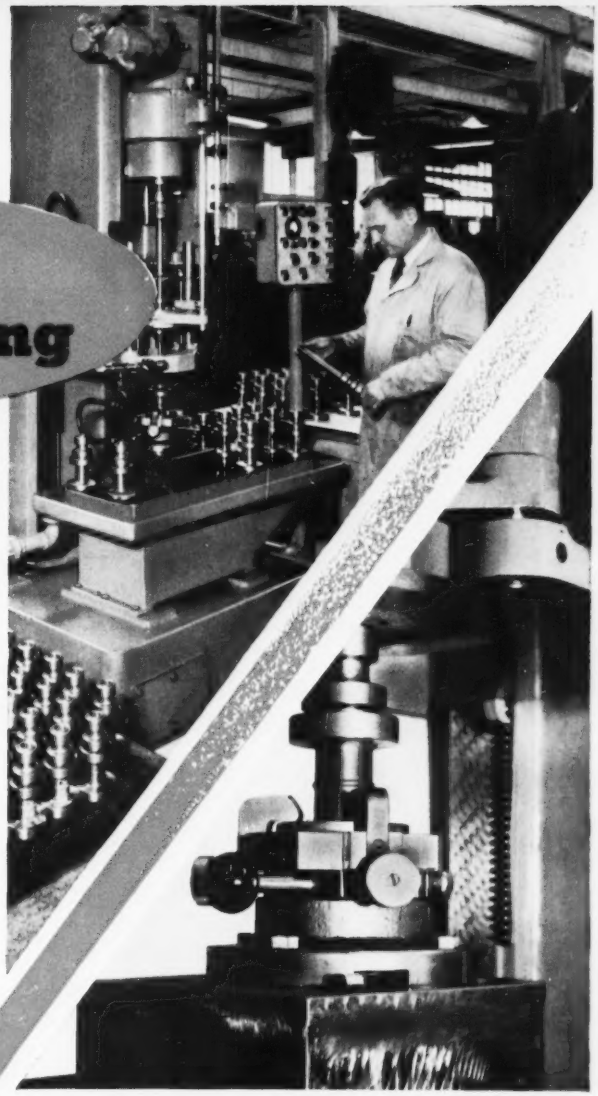
ILLINOIS, U.S.A.



These Gear Blanks HONED and SIZED

with

BARNESDRIL Plugmatic Sizing



AUTOMATICALLY To .0002″

Bore-to-Bore for Size, Roundness, and Taper

These precision gear blanks are honed on a new No. 223 BARNESDRIL Honing Machine equipped with BARNESDRIL Plugmatic Bore-To-Bore Sizing. All subsequent gear operations are held relative and close accuracy from bore-to-bore is very important. Bores are 1″ diameter x 6-1/2″ long. A 2-spindle machine is used for greater production — cycle 24 seconds, stock removal .004″ to .005″.



Each bore honed is positively gauged. A master gauge with a self-leading nose is positioned in a floating holder. As the honing tool cuts to final size, the gauge drops into the bore and by electric controls terminates the honing cycle.

This new method offers you one type of sizing for regular, counter-bored, or blind end bores. Write for full information on this New Production Method for Finishing and Sizing. Ask for Bulletin B5005.

BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS



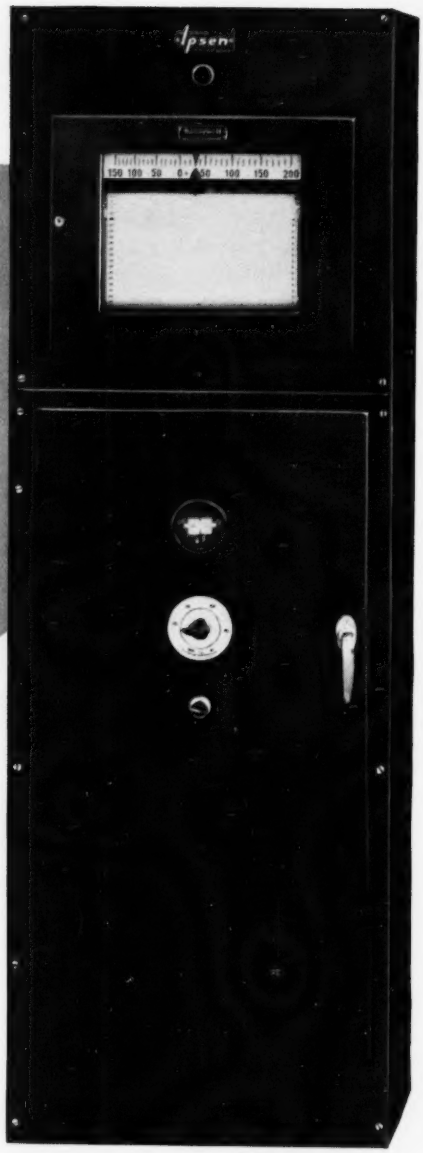
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FOR METAL REMOVAL WITH ACCURACY AND SPEED...**ROCKFORD ILLINOIS, U.S.A.**

Announcing

Ipsen

Dew Point *Controller*



PATENTS PENDING

INDICATES • RECORDS
AND CONTROLS
Automatically

★ *See* THIS NEW UNIT
AT NATIONAL METAL SHOW
CLEVELAND OCT. 19-23

AUTOMATIC **Ipsen** HEAT TREATING UNITS

IPSEN INDUSTRIES INC., 717 South Main Street, Rockford, Illinois
Universal Units to CARBONITRIDE • CARBURIZE • HARDEN • BRAZE • MARTEMPER • WASH • TEMPER

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.



GLEASON announces . . .

5

new machines

No. 104 Straight Bevel CONIFLEX® Generator

No. 106 Hypoid Generator

No. 104 Angular Hypoid Tester

No. 104 Spur Tester

No. 104 CONIFLEX Cutter Sharpener

GLEASON

GLEASON WORKS · ROCHESTER 3, N.Y.

No. 104 Straight Bevel CONIFLEX Generator

for cutting straight bevel gears from 16 DP to 3 DP, 8½" diameter, 1⅛" face.

APPLICATION:

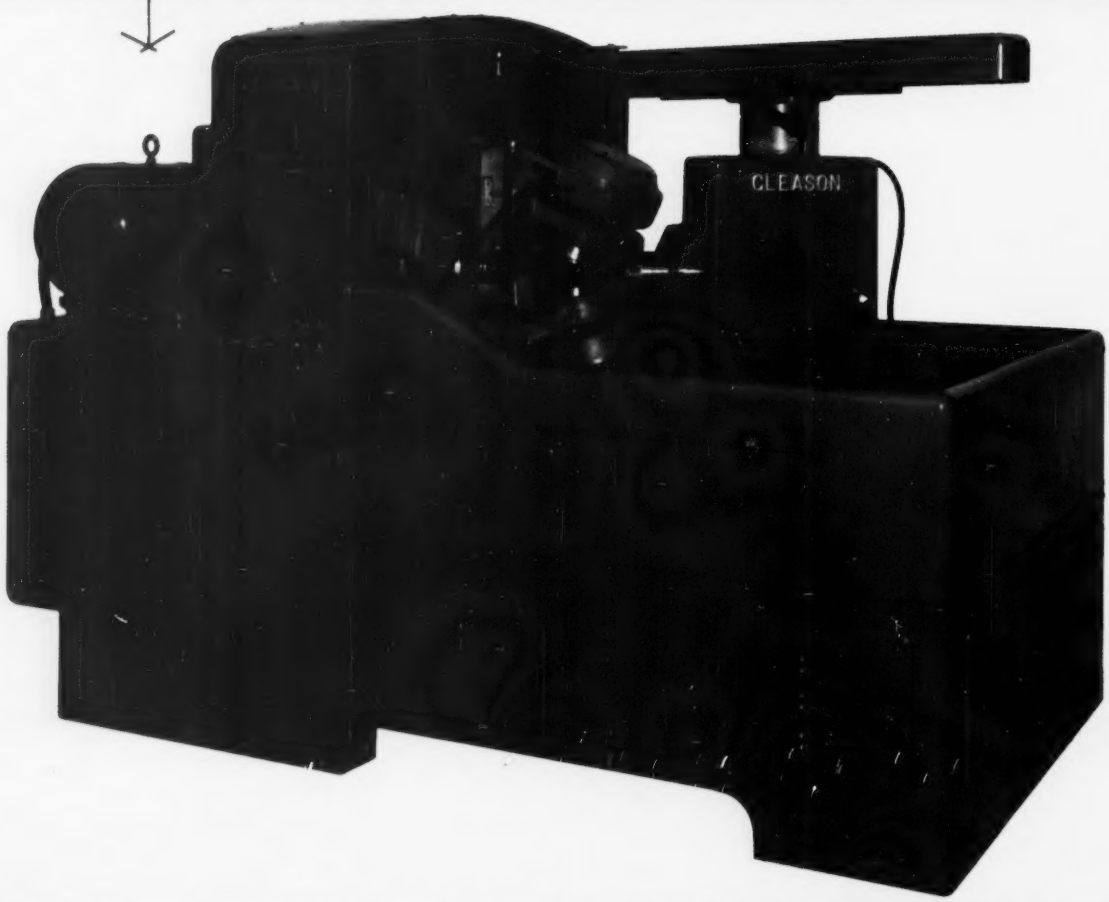
Completing of generated gears and pinions for volume production or small quantities.

ADVANTAGES:

Increased productivity—all gears completed from the solid blank in one operation . . . Highest quality – CONIFLEX tooth form fully interchangeable with that produced on Gleason two-tool generators.

FEATURES:

Cutting is done by two interlocking disc-type 9" diameter cutters . . . Small number of cutters covers entire machine range . . . Set-up and tooth development are simple . . . New generating method results in maximum cutter life, excellent finish, and high efficiency of the completing cycle.



GLEASON WORKS ROCHESTER 3, N.Y.

No. 106 Hypoid Generator

for cutting ZEROL® bevel, spiral bevel, and hypoid gears up to 4 DP, 8½" diameter, 1¼" face.

APPLICATION:

Completing, or separate roughing and finishing, of generated gears and pinions for volume production or small quantities.

ADVANTAGES:

Increased productivity—much faster rates are possible on finishing, and wider range of work can be completed in one operation . . . Improved quality . . . Set-up and tooth bearing development procedures are simplified.

FEATURES:

Use of cam-actuated generating motion increases cutting cycle efficiency . . . New type cutter spindle mounting gives greater rigidity, permits easier cutter truing on generator . . . Machine settings are simplified and permit use of all current spiral bevel, ZEROL bevel, and hypoid gear cutting systems.



GLEASON WORKS GLEASON **ROCHESTER 3, N.Y.**

No. 104
Angular Hypoid Tester

for bevel and hypoid gears up to 4¼" diameter.

APPLICATION:

Rolling test of composite tooth error, as well as power running test.

ADVANTAGES AND FEATURES:

More precise testing over a wide range of gear specifications . . . Three sizes of interchangeable spindles available for various gear sizes . . . Recording unit makes permanent chart of test results . . . Electric drag brake and wide range of speeds provided for running test.



No. 104
Spur Gear Tester

for spur and helical gears up to 4½" center distance.

APPLICATION:

Rolling test of composite tooth error, as well as power running test.

ADVANTAGES AND FEATURES:

One tester now provides both of above types of test for small spur and helical gears . . . Same features as No. 104 Angular Hypoid Tester—three spindle sizes, electronic recording unit, power testing facilities . . . Wide range of adjustments provided to accommodate various gear sizes and specifications.



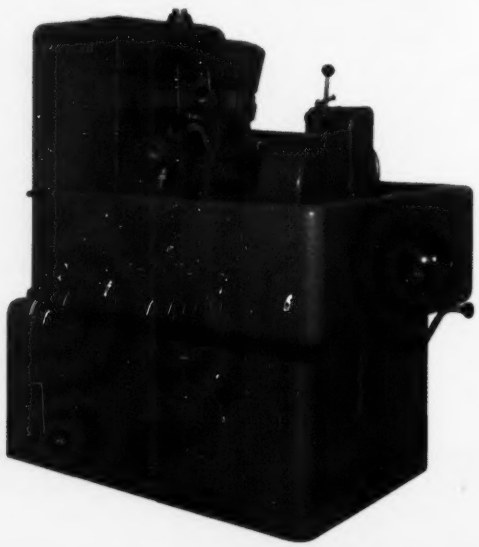
No. 104
CONIFLEX® Cutter Sharpener

APPLICATION:

Sharpening disc-type cutters used on No. 2A and No. 104 Straight Bevel CONIFLEX Generators.

ADVANTAGES AND FEATURES:

Wet grinding, with automatic stroke and feed control, assures longest cutter life . . . Exact sharpening angles are easily set and maintained . . . Machine set-up and changeover are simplified, for faster, more accurate, sharpening.



GLEASON

GLEASON WORKS · ROCHESTER 3, N.Y.

Visit us at Booth 241, National Metal Show, Cleveland, Ohio, October 19-23



any time, any place . . .

REX HIGH SPEED STEEL *is always the same, too*

You get the same outstanding performance from every Rex product no matter where or when you buy it. That's because every heat of Crucible Rex High Speed Steel is given a careful metallurgical laboratory examination to insure that each piece meets Crucible's high standard of uniformity.

And its high cutting efficiency, uniform hardening response, and combination of maximum red hardness and toughness make Rex High Speed Steel the standard choice in important shops throughout the country.

When you need high speed steels specify REX. They are readily available from all Crucible warehouses and leading distributors everywhere.

WRITE TODAY for the unique Crucible Tool Steel Selector, 9" diameter, in 3 colors — a twist of the dial tells you which tool steel is best for your application. Address your request to Crucible Steel Company of America, Dept. M, Oliver Building, Pittsburgh 22, Pa.

Rex® High Speed Steels
Peerless Hot Work Steels
Halcomb 218
Chro-Mow®
Sanderson Carbon Tool Steels
Ketos®
AirKool Die Steel
Airdi® 150
Nu-Die V Die Casting Steel
CSM 2 Mold Steel
La Belle® Silicon #2
Atha Pneu

SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking **TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

(For more information on products advertised, use Inquiry Card page 245)



One-Stop shopping

for brass rod and bar

You can get rod or drawn bar of Chase Free-Cutting Brass, Copper or a wide variety of other copper alloys at one stop – *the Chase Warehouse nearest you!*

When you want free-cutting materials, it pays to buy Chase – for Chase rod and drawn bar yield the shorter chips that make for *easier machining, longer tool life.* They produce smooth, clean-surfaced products – less expensive to buff or polish before lacquering, enameling or plating.

And when it comes to re-ordering, remember that Chase alloys are uniform – repeat orders of the same alloy always have the same cutting characteristics.

Chase® BRASS & COPPER

The Nation's Headquarters for Brass & Copper

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Albany †	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver †	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester †	(† sales
Cincinnati	Indianapolis	New Orleans	St. Louis	office only)

(For more information on products advertised, use Inquiry Card page 245)

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

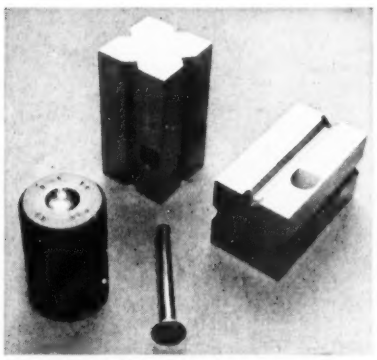
PENCIL SLIPPED . . . DIES BROKE

One of our customers reported his cold-heading dies were cracking and spalling. The spalled areas appeared to be the result of the hard case upsetting into the softer core.

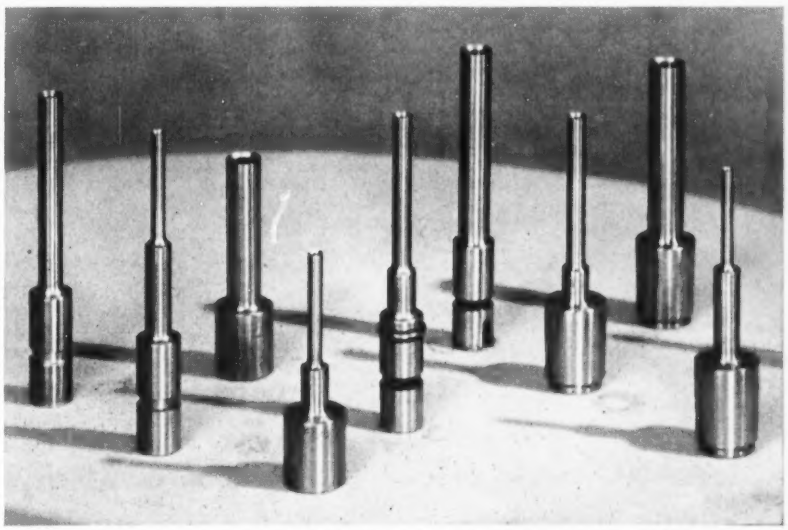
Our metallurgical contact man who visited the customer's plant couldn't find anything out of order, until he happened to read over an order the customer had entered for the steel. Then the light began to dawn.

The answer? The customer had failed to specify "cold-heading die quality" on the order. There's quite a difference between ordering "carbon tool steel" and "cold-heading die quality steel."

It's the difference between a tool steel that's processed for doing a fine job on severe cold-heading and steel that just isn't suitable for this type of special application.



The gripper and header dies shown above, made of Bethlehem XX Cold-Heading Die Steel, have the right combination of hard surface and tough core for cold-heading thousands of steel bolts each day.



"Even the roughest kind of service in binderies and printshops won't break paper drills when they're made of Omega tool steel," says William Gynther of Bent and Gynther, Portland, Ore.

OMEGA HELPS TO STOP BREAKAGE OF PAPER DRILLS

Drilling holes through paper may sound easy, but it isn't. Printers who do much paper-drilling will tell you that the drills often break and bend.

The other day we were given quite a fill-in on the subject by William Gynther, one of the owners of Bent and Gynther, Portland, Ore., suppliers of drills to the printing trade. Mr. Gynther told how he once noticed four broken drills on the desk of a prospective buyer. He made a wager that *his* drills wouldn't break, even though this printshop apparently gave the drills pretty severe treatment. The printer took him up—and hasn't broken a drill in some years.

The success of the "B and G" drills is attributed by Mr. Gynther to the unique taper inside the drill and to the grade of tool steel (Bethlehem's Omega). Omega is our silico-manganese grade of shock-resisting steel, and while it is intended mainly for cold-battering tools where terrific shock must be absorbed, it appears to have the ideal hardening properties for these paper drills, together with plenty of the toughness required to withstand stress and strain.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

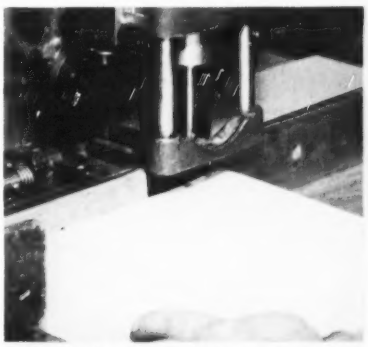
Always temper immediately after hardening

It's always risky to delay or to omit tempering immediately after a hardened tool cools following the quench. With a liquid-quenched steel always get the tool into the tempering furnace as soon as it cools down to about 150 to 200 F.; an air-hardening steel should cool to 150 F.

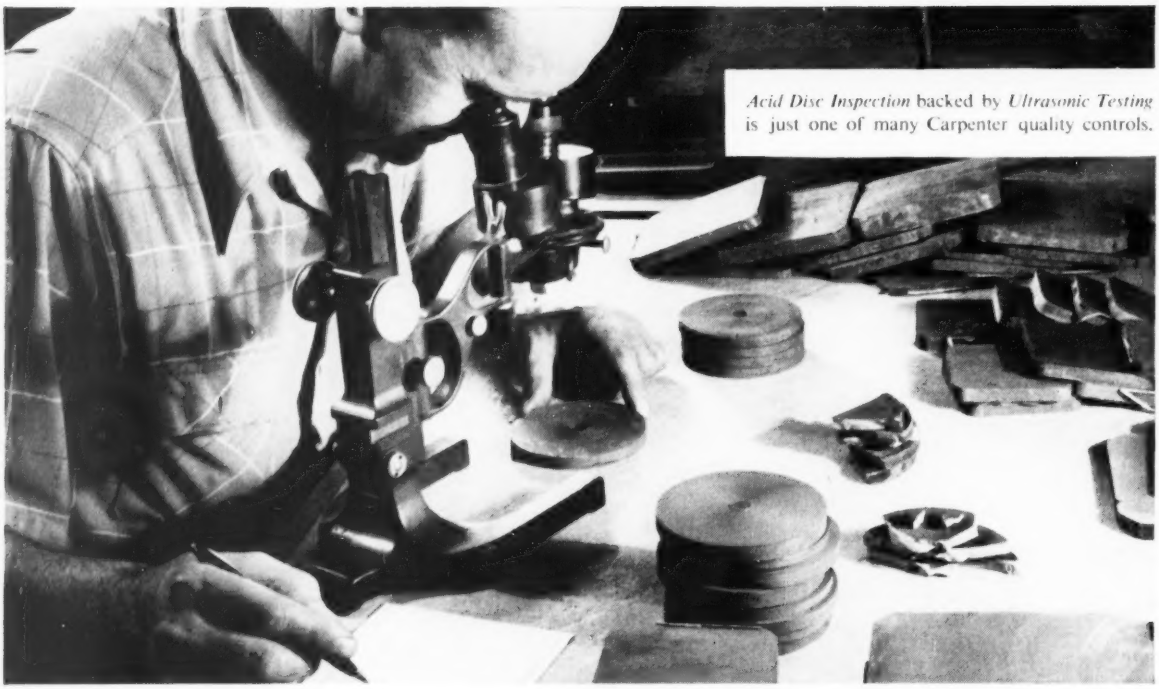
Some heat-treaters spit on a tool — if there's no sizzle, it's cool enough to temper. You can also use a contact pyrometer or other indicators to get a more accurate check on the temperature of freshly quenched tools.

If you delay the temper — to check hardness or for some other reason — you're running the risk of permitting stresses to build up. And these stresses may crack the tool in half, even before it reaches the tempering furnace. Of course, such failures don't always occur if this precaution is ignored.

Some people just can't be convinced that it's risky to delay tempering after the tool cools following the quench. But there's no way to predict just when it may happen, so why take the risk?



Boring holes through a stack of paper doesn't sound like a tough job, but there's a lot of stress on these hollow drills which causes frequent breakage—unless they're made of the right steel.



Acid Disc Inspection backed by *Ultrasonic Testing* is just one of many Carpenter quality controls.

IF YOU USE TOOL STEEL, THESE ARE FACTS YOU SHOULD KNOW

When you make or use a tool or die you invest a sizable sum of money. And there are steps you normally take to protect your investment. You make sure the design is right. You follow through with accurate toolmaking and correct heat treating. But there is *one* factor involved in the success of your die, over which you have only indirect control. That factor is the *soundness* of the die steel you start with. After all, if the steel itself isn't right, you needlessly risk your entire investment.

How can you be *sure* the die steel you use has what it takes to assure good tools? The answer lies in the painstaking controls regularly practiced by the steel manufacturer. Listed here are the four important tool steel controls pioneered by Carpenter to give steel users like yourself the protection you need. Before you place that next tool steel order, ask yourself, "Does our steel supplier guarantee these four quality controls in the die steel we use?" Then remember: You can be *sure* of them when you specify Carpenter Matched Tool and Die Steels. And you don't pay anything extra! The Carpenter Steel Company, 105 W. Bern St., Reading, Pa.

4 Tool and Die Steel Developments *Pioneered by Carpenter*
Help Carpenter Customers Cut Costs, Improve Die Performance

Since 1929:
HOT ACID DISC INSPECTION has been standard practice at Carpenter. To Carpenter customers it provides full assurance that Matched Tool and Die Steels are internally sound, shipment after shipment.

Since 1930:
The TOUGH TIMBRE TEST has assured Carpenter users a wider safe hardening range, greater dependability in performance.

Since 1933:
The TORSION IMPACT TEST has provided Carpenter Matched Tool and Die Steel users with more complete heat treating information that leads to better tools and dies.

Since 1940:
The CONE TEST, used to check and control hardenability of Carpenter water-hardening Matched Tool and Die Steels, has made sure that sections of the same size have uniform hardness penetration in lot after lot.

Carpenter Matched Tool and Die Steels

No. 610 · HAMPDEN · K-W · STAR ZENITH
No. 484 · STENTOR · 11 SPECIAL · T-K
VEGA · RDS · SOLAR · No. 883

Export Department: The Carpenter Steel Co., Port Washington, N.Y. "CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U.S.A. and Canada

(For more information on products advertised, use Inquiry Card page 245)

HOW DO YOU PUT A HEAVY PHOSPHATE COATING ON 90 MM. SHELLS?

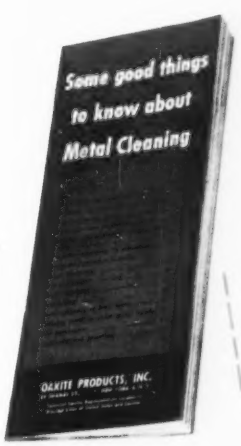
HOW CAN WE GET BETTER ELECTROCLEANING AT LOWER COST?

These are two of the simplest of the hundreds of metal-cleaning questions that come to us every day.

We answered our first metal-cleaning question for our first customer in 1909. Today we have 180 Oakite Technical Service Representatives answering metal-cleaning questions in the plants of thousands of customers in all the metal-working centers of the United States and Canada.

We thrive on these questions. They give us our daily work. The check list at the right shows the kind of jobs we do:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning
- ☐ Pickling, deoxidizing
- ☐ Pre-paint treatment
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ Treating wash water in paint spray booths
- ☐ Cooling and lubricating for machining and grinding



Please use the coupon to ask us your metal-cleaning question or to let us know of any other way in which we can help you.

OAKITE PRODUCTS, INC. 26 Rector St., New York 6, N. Y.

Tell me (without obligation) about Oakite methods for removing the following soils:

_____

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_____

Name _____

Company _____

Address _____

☐ ALSO send me a FREE copy of your booklet "Some good things to know about Metal Cleaning."

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

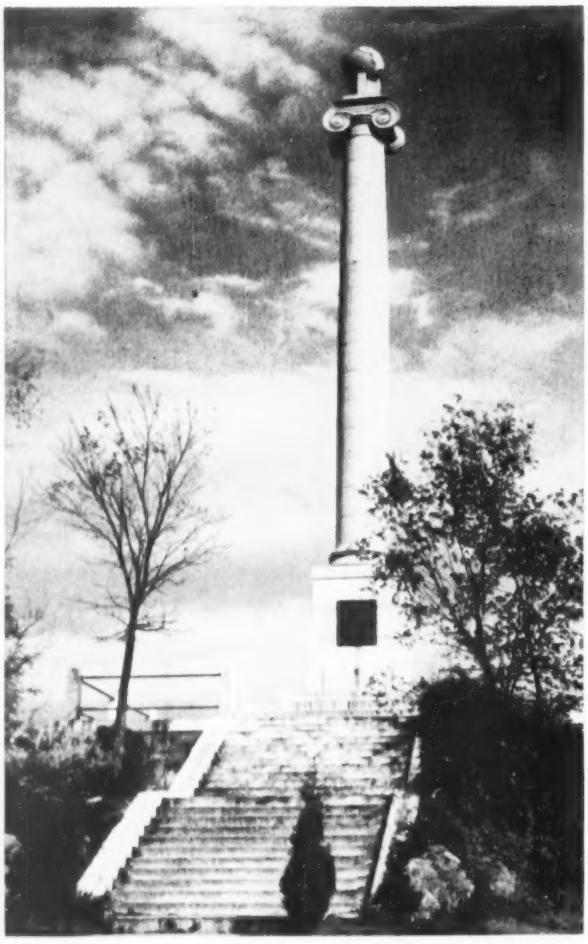
Technical Service Representatives Located in Principal Cities of United States and Canada

At the Metal Show Visit Oakite Booth 2573

(For more information on products advertised, use Inquiry Card page 245)

CUMBERLAND GROUND BARS

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

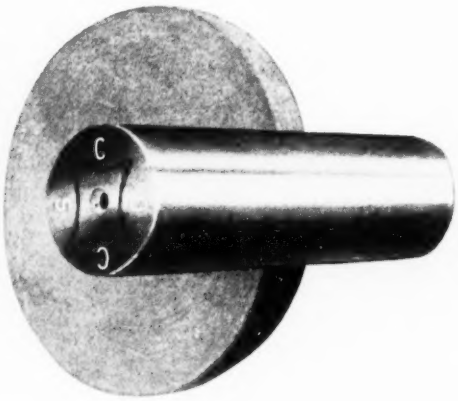


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was shown the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

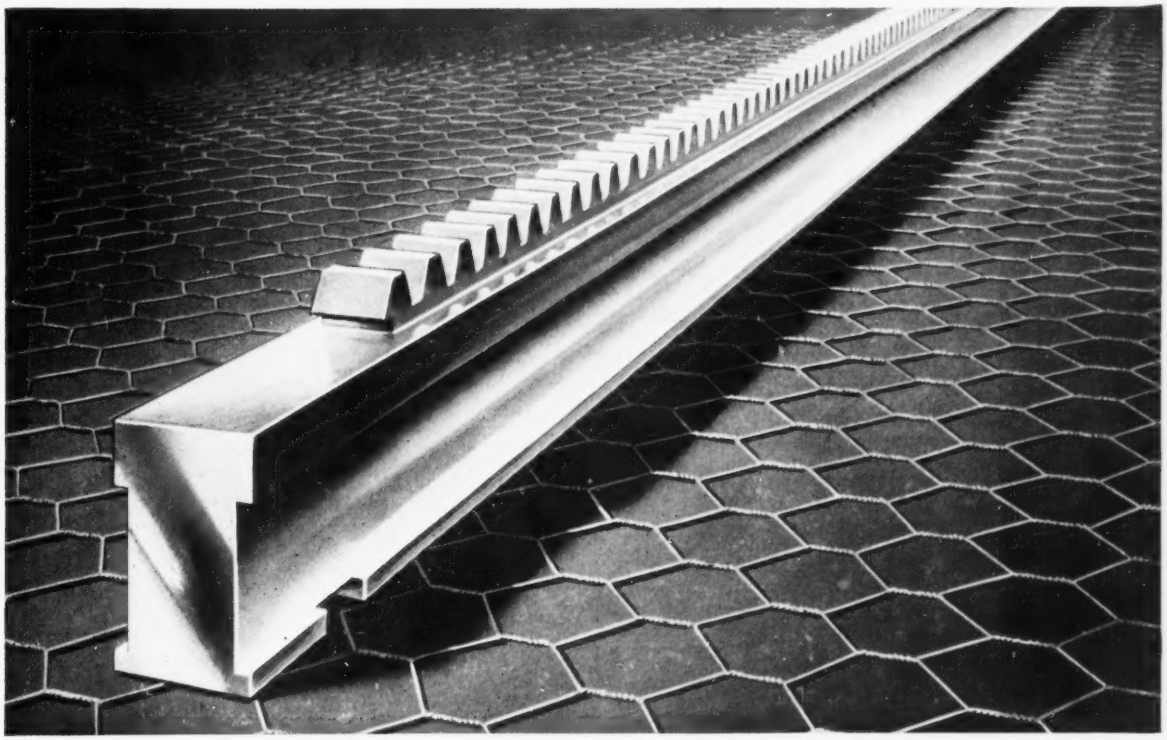
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CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 INCORPORATED 1892

(For more information on products advertised, use Inquiry Card page 245)



7-foot Graph-Mo® steel rack hardened without distortion

THIS long, slim gear rack, part of a new Wean Equipment Company hexagon netting machine, started out as a problem child.

With the first steels tried, case hardening caused extreme distortion. And the few racks that did harden straight enough to be useable did not wear well.

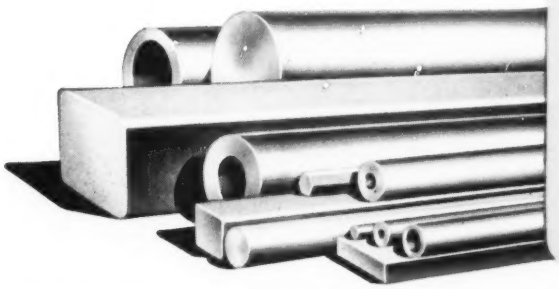
As soon as the manufacturer turned to Graph-Mo®, one of four graphitic steels developed by the Timken Company, the problem vanished. Because Graph-Mo responds uniformly to heat treatment, the racks hardened without distortion. Heat-treating scrap was completely eliminated.

In addition, the Graph-Mo racks gave exceptional wear. First, the free graphite in Graph-Mo's structure acts as a built-in lubricant—reduces friction between the rack and the gears it engages. Second, diamond-hard carbides in Graph-Mo give it great resistance to abrasion and wear.

On top of all this, there was a 30% saving in machining time—Graph-Mo being easier to machine than ordinary tool steels.

For helpful information on the use of Graph-Mo and other graphitic tool steels for machine parts, dies, punches and gages, write for the 10th edition of "Timken Graphitic Steel Data Book". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

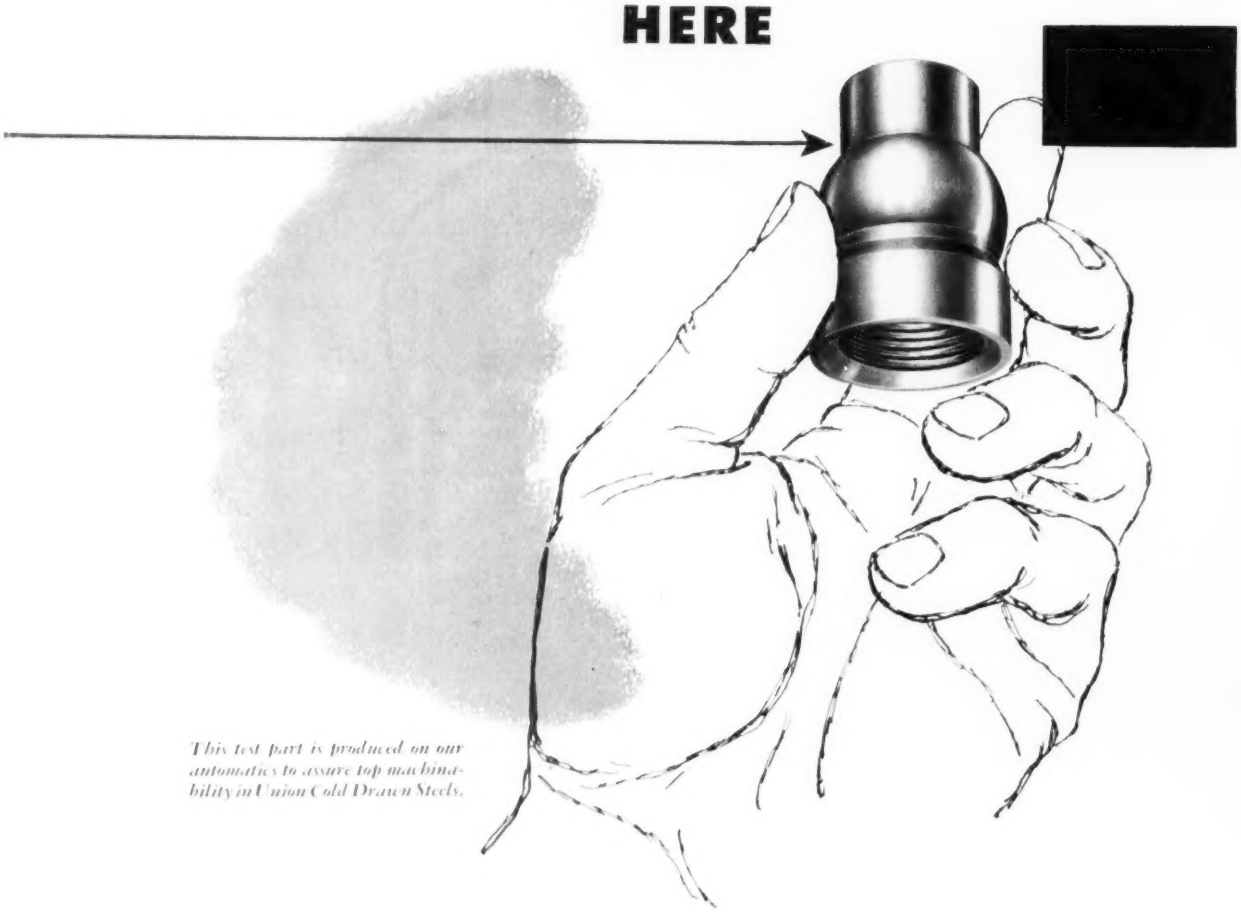
Fine Alloy

STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

(For more information on products advertised, use Inquiry Card page 245)

PRE-TESTED MACHINABILITY HERE



This test part is produced on our automatics to assure top machinability in Union Cold Drawn Steels.

What we learn about Union Cold Drawn Steels on *our* automatic screw machines at Massillon, Ohio, helps you make a better product at a better profit when you cut those steels on *your* automatics.

That's why Union Drawn's "Pre-Tested Machinability" idea keeps set-up men and operators happy when they're running Union Cold Drawn Stock . . . they get set-up sooner, with fewer headaches, using the best combinations of feed and speed. There are more parts in the shipping pan, fewer parts in the reject box. Profits stay up, costs stay down.

And it's all because we, too, have automatics! They run all day long, doing the six most common operations on the test part above. A part that has no practical use except to us at Union Drawn . . . and to you who use Union Cold Drawn Stock.

Our Union Drawn Field Metallurgists would welcome the chance to talk with your set-up man, swap hints on tool angles, heavier feeds, faster speeds. When shall we call?

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

REPUBLIC STEEL



6 HELPFUL MANUALS

filled with how-to-do-it information and data to help you use Union Cold Drawn Steels. Write for "Union Drawn Pocket Library."



Republic UNION® COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels

•

Union Cold Drawn Special Sections

•

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

(For more information on products advertised, use Inquiry Card page 245)

News About Created-Metals

New "Brief-A-Log" Simplifies Ordering

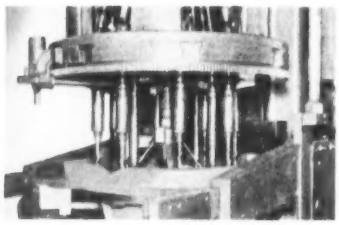


A new condensed catalog and price list is being offered by the Carboloy Department of General Electric Company.

This "Brief-A-Log" (GT-265) incorporates Carboloy price reductions made June 22, and latest additions to the standard lines of tools and blanks.

Designed to simplify selecting and ordering, the Brief-A-Log is available free of charge. (Send coupon at right.)

Drill Cast Iron with Carbide Twist Drills



Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Company. (See address at right.)

New Applications for Carbide Press Dies

Carboloy carbide dies are being profitably applied to blanking and piercing operations where production runs are high.



These dies are economical to use because they produce burr-free, close-tolerance work . . . outlast steel dies by 8 to 10 times.

Write for free Carboloy Die Engineering Manual D-124. (See address at right.)

YOUR CARBOLOY FIELD ENGINEER SAYS . . .

"Large, costly special



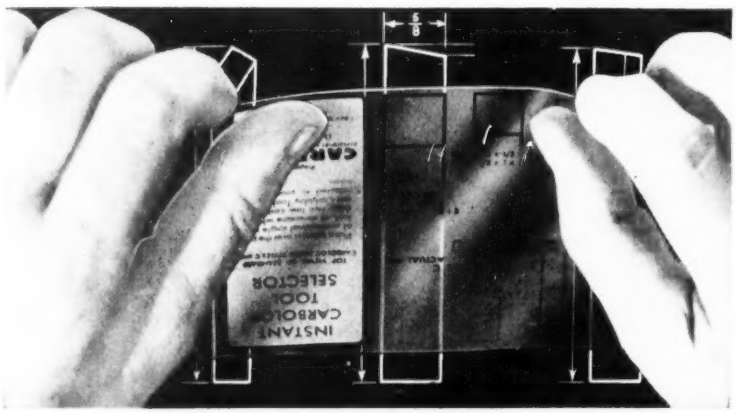
"Cut your special single-point tool stocks up to 30% with this simple-to-use MTI Plan

"The Minimum Tool Inventory Plan is based on the fact that the 11 Standard Carboloy Tools can be adapted to up to 80% of your special single-point jobs . . . thus eliminating many costly, made-to-print tools.

"The MTI Plan will show you which 'specials' can be eliminated, and exactly how much you'll save. With the 15% price reduction on Standard Carboloy Cemented Carbide Tools, in effect since June 22, now, more than ever before, it pays to standardize."

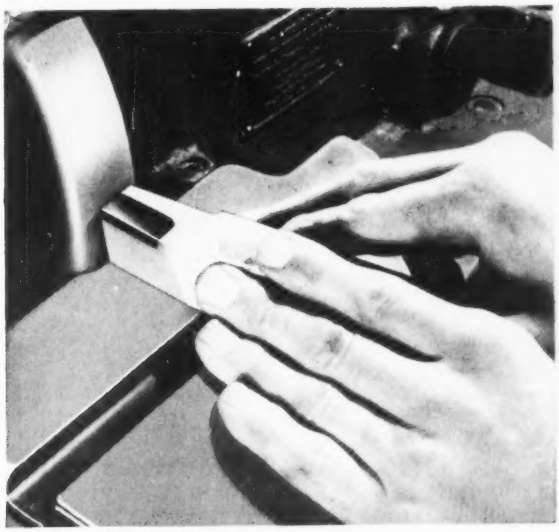
Send the coupon at right, attached to your company letterhead, for your free MTI Plan Kit. Then, determine your *own* benefits from the MTI Plan as follows:

1. **Using the Instant Tool Selectors,** you'll see at a glance how only 11 Standard Carboloy Tools can be easily and quickly adapted to handle 4 out of 5 of your special, made-to-print tool jobs.



inventories of tools now unnecessary"





2. **With the handy Plan Sheet provided,** you'll quickly get a dollars-and-cents answer showing how much you'll save by standardizing. Simple subtraction shows you how much your inventories can be cut by using standards.

3. **Order the Standard Tools** you'll need from your local Authorized Carboloy Distributor. Use them "as is," or quickly grind them to your specifications. Grinding hints, price lists and Standard Tool specifications are included in Kit.

AUTHORIZED CARBOLOY® CEMENTED CARBIDES DISTRIBUTORS

CARBOLOY TOOLS ARE STOCKED COAST TO COAST

Look under "Tools" in the Yellow Pages of your local telephone book or in Thomas' Register for your nearby Carboloy Distributor. He has complete local stocks and services. Ask him about the MTI Plan.

"Carboloy" is the registered trademark for the products of the Carboloy Department of General Electric Company.

Send coupon—pinned to your company letterhead—for your free MTI Plan Kit

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11147 E. 8 Mile Avenue, Detroit 32, Michigan

- ☐ Please rush me, at no cost or obligation, MTI Plan Kit
- ☐ Have your sales representative call to show me the Kit, without obligation
- ☐ Send me the new, free Brief-A-Log GT-265, containing complete specifications and prices of Standard Carboloy Tools and Blanks

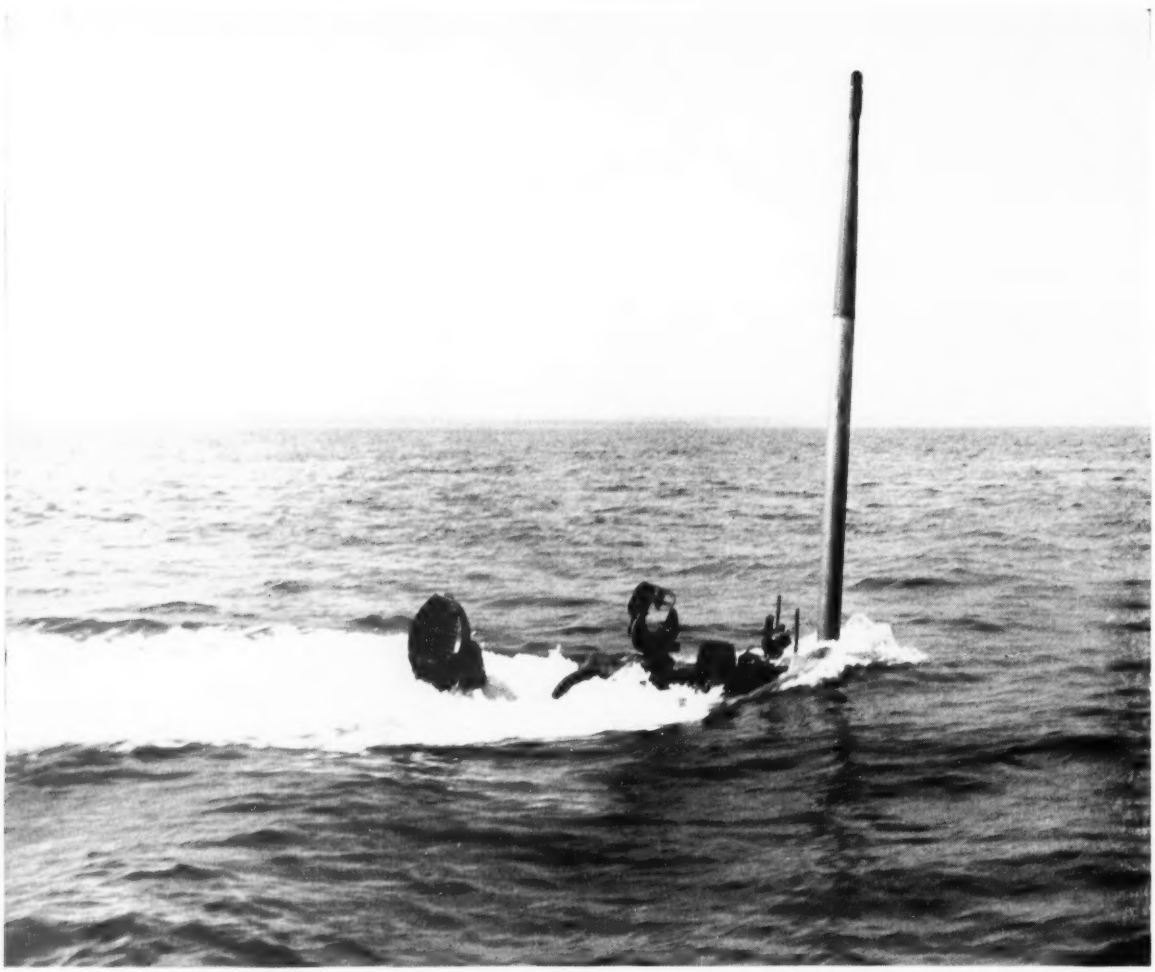
Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____

Here's a picture of some SPECIAL ALLOY STEEL



—and there's much more to it than appears on the surface

Only a stainless steel periscope tube, and some special navigational apparatus, shows above water. But below, a wonderfully compact mass of fighting machinery—literally packed with special steels and electrical alloys. *With* them, the ship is almost human. *Without* them, it has no eyes, ears, power . . . or usefulness. ● When *you* have to combat corrosion, heat, wear or great stress—or require unique electrical properties—check with us. *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

Warehouse stocks of Allegheny Stainless carried by all Ryerson plants

AL
LEADING PRODUCER HIGH-ALLOY STEELS

WAD 4146 II

PIONEERING on the Horizons of Steel

Allegheny Ludlum

(For more information on products advertised, use Inquiry Card page 245)

First quality

die steels *for* hot work

HOTFORM NO. 1
5% Cr — air hardening

NO. 2

NO. 3

CHOICE NO. 1
4% Cr — 1% C

MARVEL
9.50% W — 3.50% Cr

HOTPRESS
9.50% W — 2% Cr

WW HOTWORK
12% W — 12% Cr

FORGE-DIE
.25% C — 14% W

SC SPECIAL
.41% C — 14% W

RED CUT SUPERIOR
("J" TEMPER)
.50% C — 18% W

VAN-LOM
.60% C — 8.25% Mo

These Die Steels are designed to meet your every hot work requirement. They are made to exacting standards and inspected by magnaflux, reflectoscope and deep etching to insure First Quality Steels. All grades are available in bars and forgings.

Our sales representatives will be glad to work with you in selecting the best grade for your particular job and in the correct heat treatment for maximum performance.

Booklet "Die Steels for Hot Work" sent on request.

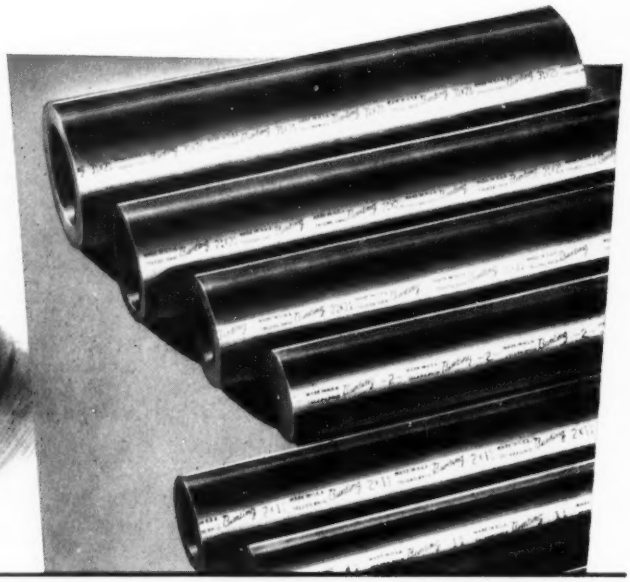


Vanadium-Alloys
STEEL COMPANY
LATROBE, PENNA.

COLONIAL STEEL DIVISION · ANCHOR DRAWN STEEL CO.

They MEET MANY NEEDS!





Bunting Precision Bronze Bars

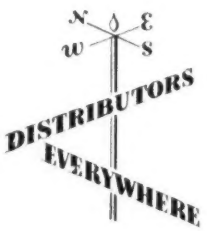


Bunting Precision Bronze Bars are especially designed for maintenance work. Completely machined and finished on all surfaces, these bars save costly machining time, wasted metal and wear on cutting tools. They run true when centered in your lathe. They are made of the finest Bearing Bronze—Bunting No. 72 (SAE 660). Always carried in stock by your local Bunting Distributor.

The Bunting Distributor



Your Bunting Distributor is an industrial distributor or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock, for your money saving convenience, completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars in a complete range of sizes meeting all your usual production and maintenance needs. Ask him for catalog.

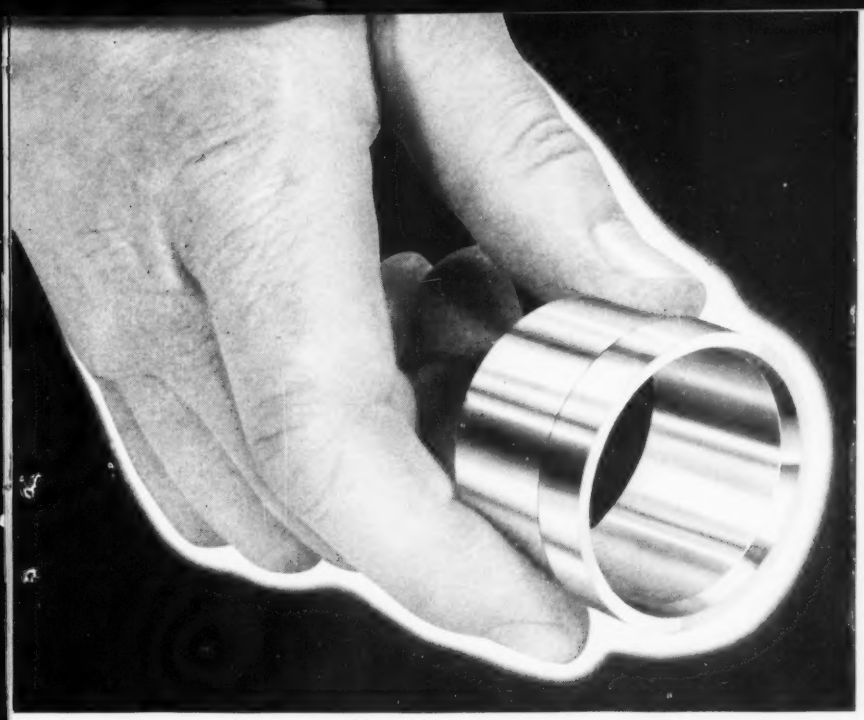


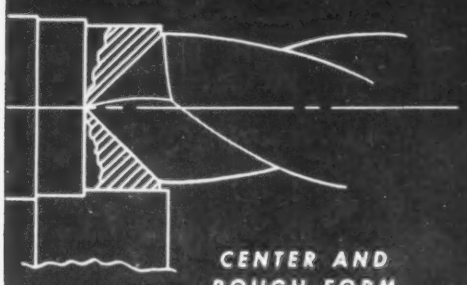
Bunting®

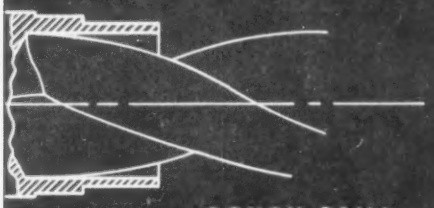
BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

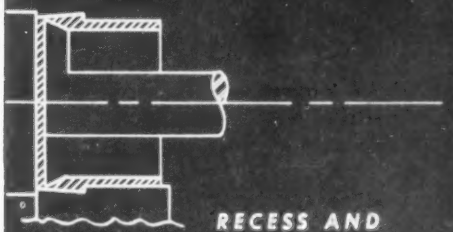
THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

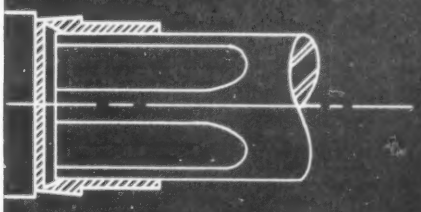
(For more information on products advertised, use Inquiry Card page 245)

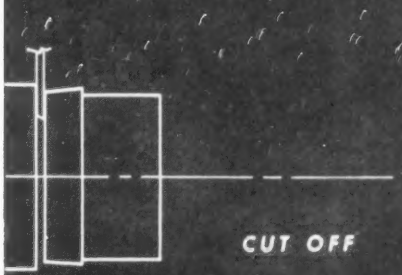












Good coolant practice makes machining aluminum easy

If your tools dull quickly, your work runs hot or chips pile up in the tool zone, check your coolant.

Be sure you are using an adequate volume of coolant consistent with operating conditions. Keep the nozzles open. Direct the coolant stream to hit the work and tools, at the proper angle. Chips should be washed away to prevent fouling the tools. Use a good cutting fluid. Special aluminum coolants generally consist of light mineral oil with 5—10 per cent fatty additions. Viscosity should be 45 to 65 seconds at 100° F on a Saybolt Universal Viscosimeter. Flash point should be above 270° F.

Your local Alcoa sales engineer will gladly answer your questions about coolant practice, alloy selection and machining. You'll find him listed under "Aluminum" in your classified phone book. Aluminum Company of America, 870-K Alcoa Bldg., Pittsburgh 19, Pa.



ALCOA OFFERS TWO BOOKS— *Alcoa Aluminum in Automatic Screw Machines* —a 95-page book containing information on tool design, setup and operating techniques.

Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

BASIC ECONOMICS FOR BUYERS

While you buy screw machine stock by the pound, you machine it by the foot. A pound of aluminum gives you three times more feet of stock than a pound of brass or steel.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA



"We can run Free-Machining ENDURO Stainless Steel Bars at about 90% of our Bessemer screw stock rate"

● Yes! You can switch the steel specification for a part from Bessemer screw stock to either of two grades of ENDURO Stainless Steel Bars (A.I.S.I. 416 and 430-F) with only a minor difference in your automatic production rate. These ENDURO Stainless Steel Bars, as cold-finished by Republic's Union Drawn Steel Division, are *fully 90% as machinable* as Bessemer screw stock. But now consider the plus benefits such a switch to ENDURO can give you!

Close tolerance, accuracy of section, uniform soundness, fine surface finish—to help you produce fine quality parts at highest production rates and at lowest costs. Plus the high strength of an alloy steel. Plus the stubborn resistance to rust and corrosion for which ENDURO is famous.

Free-machining ENDURO also is available in hot-rolled bars and wire. And experienced Republic metallurgists will offer you expert assistance in applying ENDURO Stainless Steel in any form. Just write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic ENDURO®
FREE-MACHINING
STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

(For more information on products advertised, use Inquiry Card page 245)

Coming Out
AT THE METAL SHOW

NATIONAL METAL CONGRESS AND EXPOSITION



Make a note to see KROSLOK, the newest development in face milling efficiency. Rigidity, simplicity and uninterrupted, profitable service... Only three members: body, blade, wedge. Two blade types: high speed steel and carbide-tipped. Diameters—3" through 18".

Ask on your letterhead for new Bulletin.

THE MOTCH & MERRYWEATHER MACHINERY CO.
Cutting Tool Manufacturing Division
Cleveland 13, Ohio

(For more information on products advertised, use Inquiry Card page 243)

NIAGARA Presents

outstanding design features:

Double End Twin Drive with double reduction gearing (for straight bends and smooth power application.)

A rigid One-piece Frame with permanently welded crown for minimum deflection and permanent alignment.

Laminated Non-Metallic Ways maintain accurate alignment and assure longest life of dependable service.

Deep Twin Plate Steel Bed with open slug clearance for multiple punching work.

Powerful Air Cooled Friction Clutch and Brake assures easy ideal "Press Brake Action".

Air Electric Clutch Control may be operated by palm buttons on ram or foot switch with provisions for "Inching", "Single Stroking" and "Continuous Run".

Reversible Flywheel can be pulled out of accidental stalls.

Power Adjusted Ram with self-locking adjusting screws.

Micrometer Dials accurately indicate position of ram so die settings can be quickly repeated.

Accessibility at rear with plenty of clear working space for safety.

Gages with full horizontal and vertical adjustment for front or rear of press.

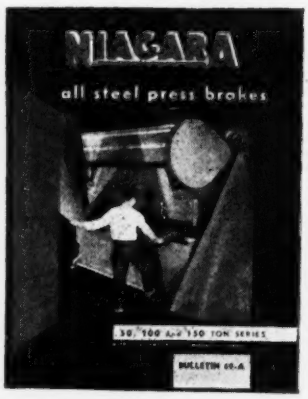
Angle Support Brackets and Bolster Plates quickly convert press for stamping operations without affecting bending ability.

All gears operate in totally enclosed sealed baths of oil.

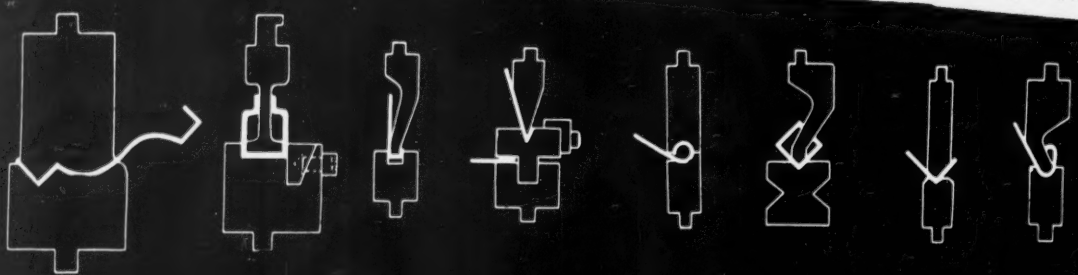
versatility of operations

BENDING	JOGGLING
FORMING	NOTCHING
DRAWING	PUNCHING
BEADING	PIERCING
CURLING	PERFORATING
CORRUGATING	SLITTING
BLANKING	TRIMMING
EMBOSSING	ETC.

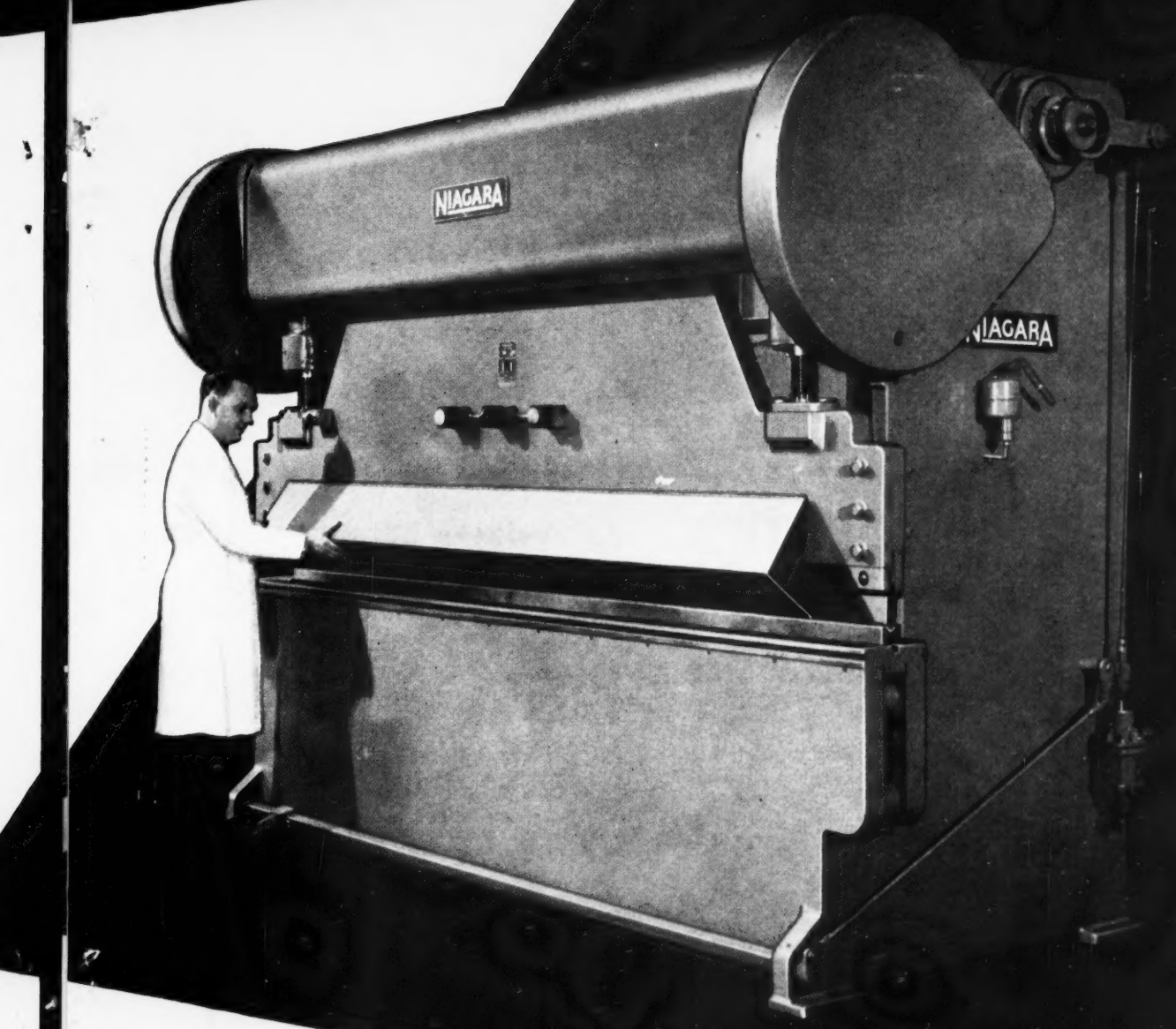
WRITE FOR BULLETIN 89



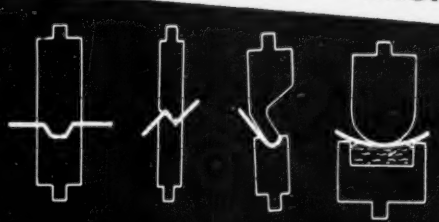
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.



The Last Word in New All-Steel
PRESS BRAKES



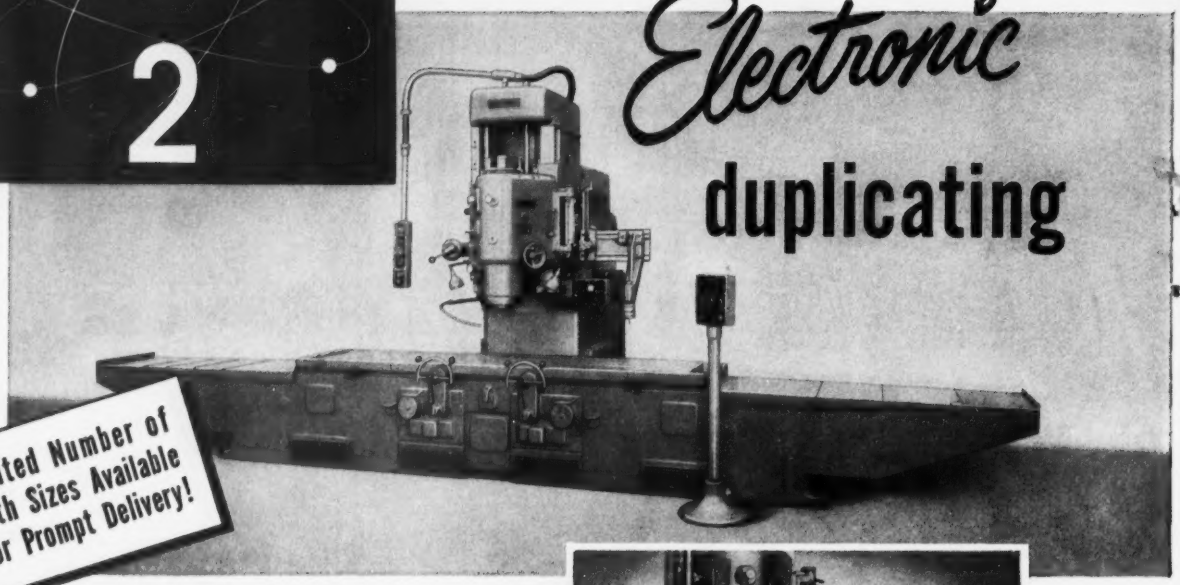
DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK, PHILADELPHIA



America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

Dealers in principal U. S. cities and major foreign countries

1 2 3 dimensional *Electronic* duplicating

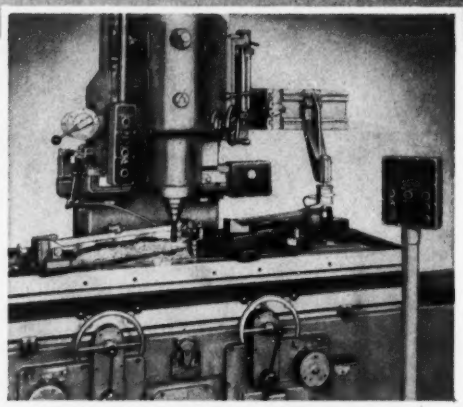


Limited Number of Both Sizes Available For Prompt Delivery!

on REED-PRENTICE 60" and 96" No. 4 MILLERS

Here's the ultimate in electronic machine control — at your fingertips! The Reed-Prentice No. 4 Vertical Miller, featuring electronic control for all feeds, provides unsurpassed accuracy in complex duplicating operations when equipped with a General Electric two or three-dimensional electronic contour follower system.

Today Reed-Prentice No. 4 Millers perform milling and profiling work for such leading manufacturers as General Motors Corp., Allis-Chalmers Mfg. Co., Chrysler Corp., Kaiser Mfg. Corp., Westinghouse Electric Corp. and National Pressure Cooker Co.

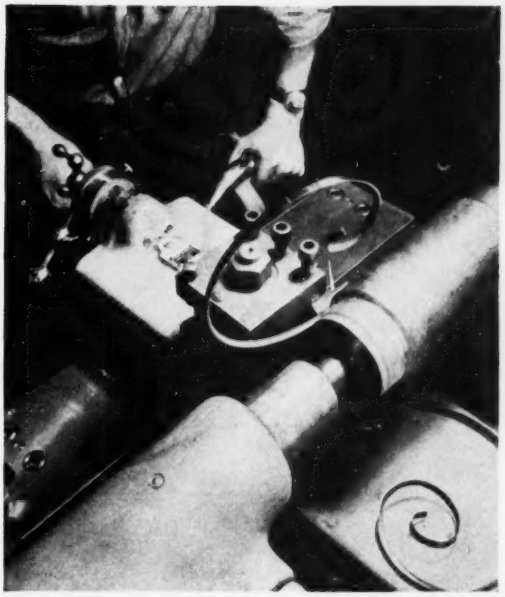


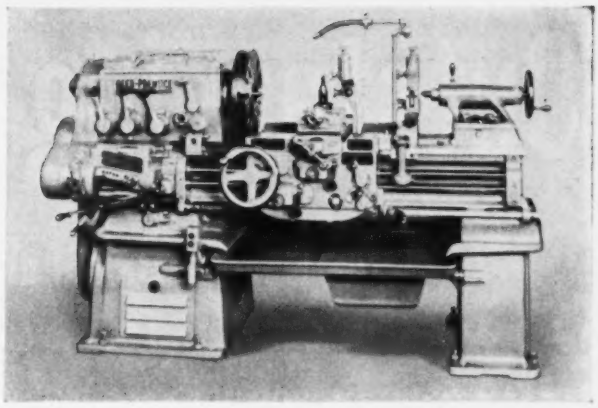
Two-dimensional electronic contour follower system on No. 4 Miller duplicating aircraft part for Kaiser Manufacturing Company of Richmond, California.

SPECIFICATIONS		#4-60"	#4-96"
Longitudinal travel of table		60"	96"
Travel of cross slide		24"	24"
Table working surface		24 x 96"	24 x 132"
Feed range		½ to 25" per minute	
Spindle speeds:	20 H.P. motor	45-1800 RPM	
	25 or 30 HP motor	90-1800 RPM	

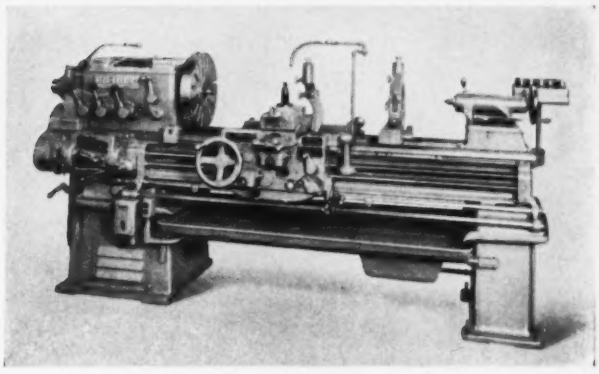
REED-PRENTICE CORP. MACHINE TOOLS WORCESTER MASS., U.S.A.

MAIN OFFICE 677 Cambridge St., Worcester 4, Mass.





Reed-Prentice 14" Engine Lathe



Reed-Prentice 16" Toolroom Lathe

ACCURATE **HEAVY-DUTY** TURNING on **Reed-Prentice 14", 16" and 20" Lathes**

Rugged construction, improved headstock design and rigid spindle mounting add up to fast, accurate turning on Reed-Prentice Sliding Gear Head Lathes. Redesigned headstock permits heavier cuts and faster turning. Both 14" and 16" Engine and Toolroom models offer spindle speeds up to 1200 R.P.M. Distance between centers is from 30" up in 24" increments.

On all Reed-Prentice Lathes, carriage bears on front and rear vees and also on the horizontal and flat bearings. Each flat surface is adjustably gibbed for wear to insure permanent cutting tool support. Separate lead-screw and feed rod construction with safety interlock prevents engagement of feed rod and leadscrew at the same time.

Hardened steel bedways for carriage vee bearings only can be furnished on Reed-Prentice 14" and 16" Lathes. Further details upon request.

Catalog #40, containing illustrated circulars on Reed-Prentice 14", 16" & 20" Lathes, is yours for the asking.

BRANCH OFFICES

75 West St., New York 6, N. Y.
1213 West 3rd St., Cleveland 13, Ohio
4001 N. Elston Ave., Chicago 18, Illinois
2842 W. Grand Blvd., Detroit 2, Michigan

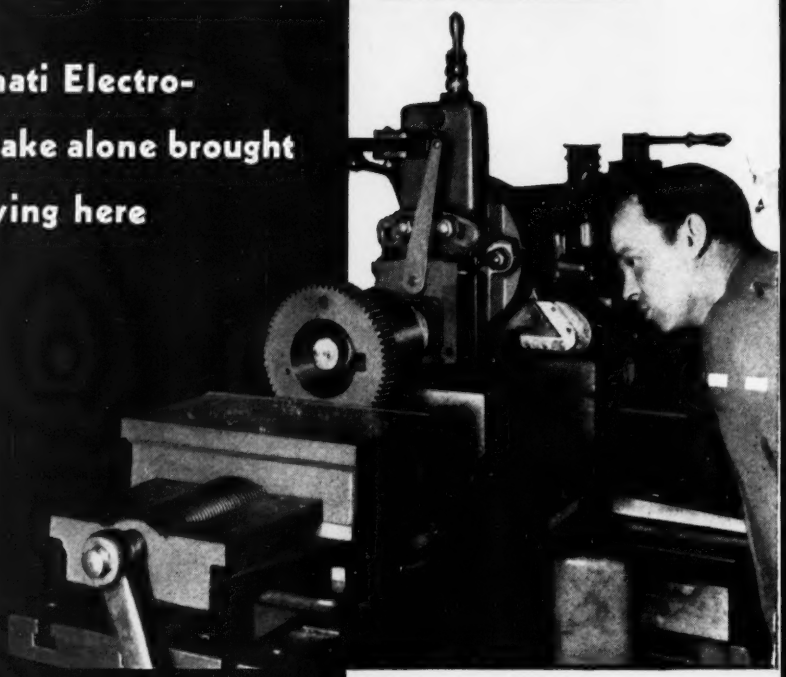
MACHINE TOOL REPRESENTATIVES

Philadelphia . . . Calco Machinery Co.
Buffalo . J. L. Osgood Machinery Corp.
Detroit . . . . . DoAll Detroit Co.
Grand Rapids . DoAll Grand Rapids Co.
Chicago . . . . . DoAll Mid-West Co.
Milwaukee . . . . DoAll Wisconsin Co.
Minneapolis . . . . Chas. W. Stone Co.
Houston . Preston Machine Tool Sales Co.
San Francisco . . Montague-Harris Co.
Los Angeles . . . . King Machinery Co.

(For more information on products advertised, use Inquiry Card page 245)

Outstanding Time Saver...

The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here



The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

Write for Cincinnati Shaper Catalog N-5.

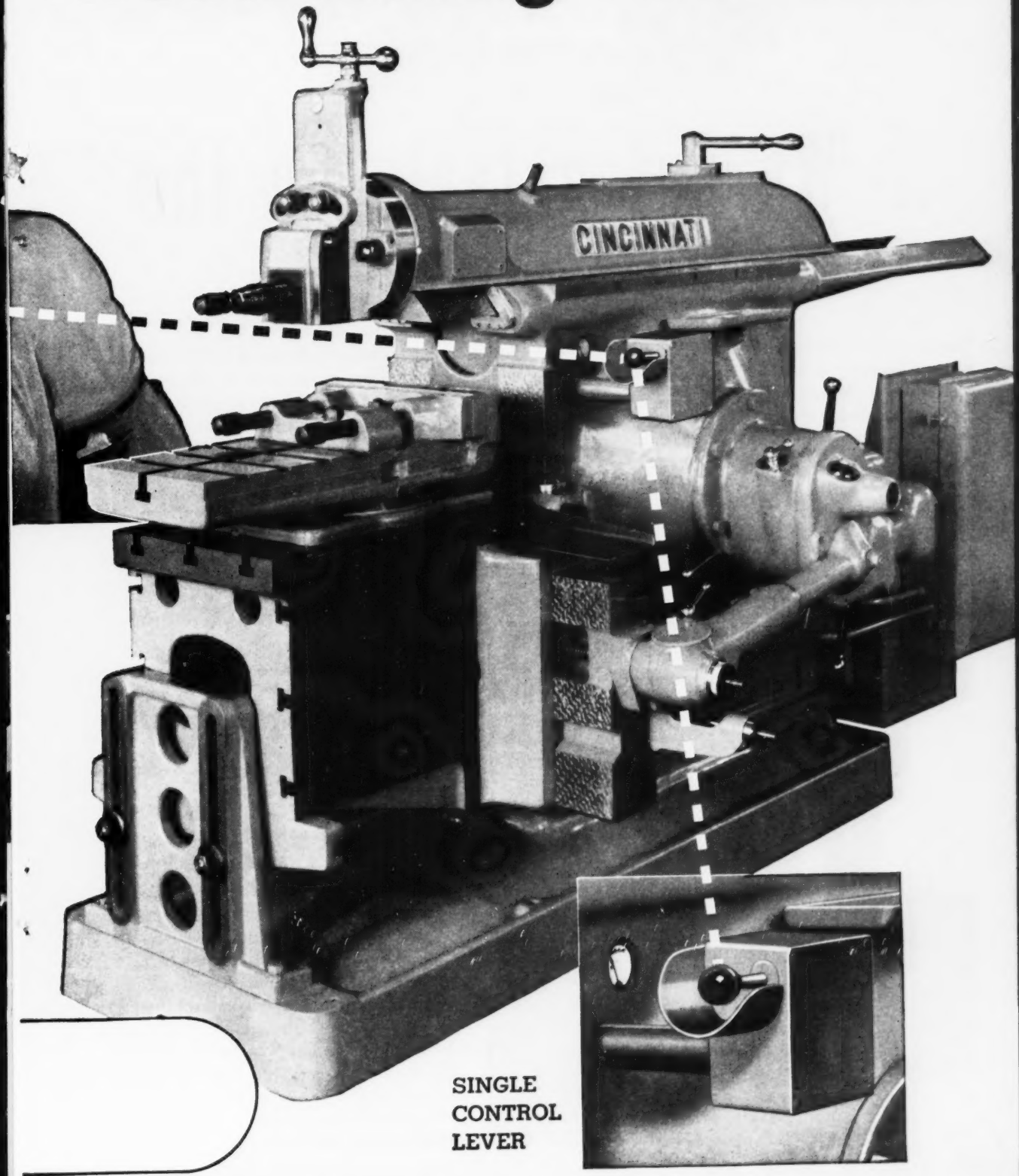
Shaping time on 7 internal oil grooves in these steel sleeves was reduced from 12.5 minutes to 8 minutes, by the Cincinnati Electro-Magnetic Clutch and Brake.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

....Outstanding ACCURACY



SINGLE
CONTROL
LEVER



Here's another reason it pays to get a proposal from Fosdick

We put a table on the

When Fosdick engineers put a table on the radial, a unique and basic machine tool was born. This machine combines the best features of two proven, reliable designs. It gives you the capacity and flexibility of a radial—the rigidity, compactness and convenience of an upright. It's the machine you need when you want versatility and economy in limited floor space.

The arm of the Sensitive Radial swings 360° on the rigid one-piece column. Controls are always at the same convenient height. Work is placed on the adjustable table, *or* on the base with the table swung out of the way. Drills up to 1½". 12" column, 3' or 4' arm, nine speeds, four feeds, 3 hp motor, reversing motor control for tapping.

For full information on the Sensitive Radial ask for Bulletin SRM.



to give you

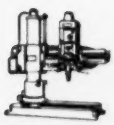
Variety problem solved at Lodge & Shipley

Building 46 lathe models from 14" to 60" requires plenty of production versatility. To drill and tap a broad variety of vari-shaped parts, *Fosdick's proposal* recommended the Sensitive Radial. Now Lodge & Shipley assigns tool blocks, levers, cam plates, spindles and many more complex parts to their Fosdick, knowing it will produce fast and easily. *Operation illustrated:* Tailstock spindle clamped to table vee. Drill, chamfer and tap 4 holes. 17/64" drill, 1020 rpm, .004 ipr, 7/8" deep. Chamfer, 1020 rpm. Tap 5/16" x 18 thread using Automatic Tapping Control (extra equipment), 240 rpm, 1/2" deep.



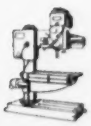
radial versatile production like this

Need Drilling Equipment? Get a Proposal from Fosdick!


Radial Drills


Jig Borers


Sensitive and Upright Drills


Sensitive Radial Drills


Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

(For more information on products advertised, use Inquiry Card page 245)

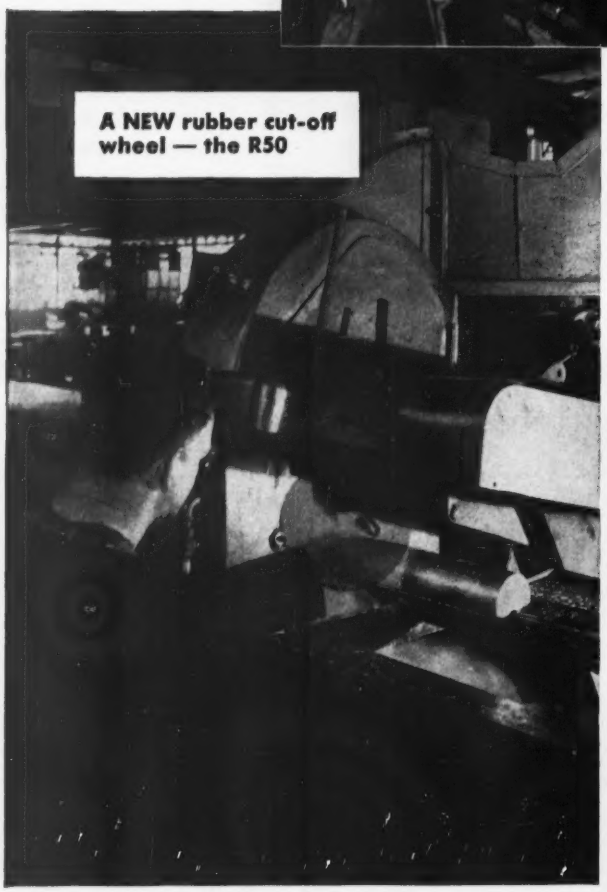
For high production — The new Norton B9 resinoid bonded cut-off wheel cuts free and cool at speeds up to 16,000 surface feet per minute. An exceptional performer on both ferrous and non-ferrous metals.

See these new cut-off wheels in action at the

METAL SHOW

in Norton Space No. 1933





Where clearance counts — The new Norton R50 rubber bonded cut-off wheel has the unusual advantage of built-in chip clearance. Ideal for wet-cutting of ferrous or non-ferrous bar stock, in diameters up to 6".



Stronger, safer, more versatile — The popular Norton BN cut-off wheel, resinoid bonded, is used on all types of machines for the widest variety of metallic and non-metallic applications.



Cost-cutters for cutting-off!

Norton wheels bring the "TOUCH of GOLD" to every job

Keeping pace with the rapid improvement in cut-off techniques and equipment, each different type of cut-off wheel in the broad Norton line has individual features for top efficiency and economy in its particular job range. For example:

The new Norton B9 resinoid bonded wheel is made with either smooth sides or with the rougher "F" sides for more clearance in the cut. It is a high production wheel. The B9 cuts free and cool, with a minimum of burning, and will give you long, money-saving service in the widest range of metal-cutting applications.

The new Norton R50 cut-off wheel, rubber bonded, is designed especially for wet-cutting of bar stock up to 6" diameter. Built-in chip clearance — a great advancement in this type of wheel — is one of its advantages that assure freer, faster cutting with maximum strength and service life.

Long a great favorite for metallic and non-metallic cut-off jobs, the resinoid bonded BN wheel features versatility and safety. On low speed and high speed cut-off machines and portable grinders and saws — and on jobs ranging from cutting tile to slotting track welds — the BN has proved its ability to deliver up to six times longer wheel life, with breakage practically eliminated.

Other outstanding Norton cut-off wheels include the resinoid bonded B2 and the rubber bonded R30 and R20. The B2, a valuable general purpose cut-off wheel for the tool room, is also widely used on non-metallic materials. The R30 is recommended for small diameter work and fine slotting, while the R20 is a highly durable wheel for use where dressing action is severe.

Ask your Norton distributor about the correct Norton cut-off wheels, in ALUNDUM* abrasive or CRYSTOLON* abrasive, for your materials and machines. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

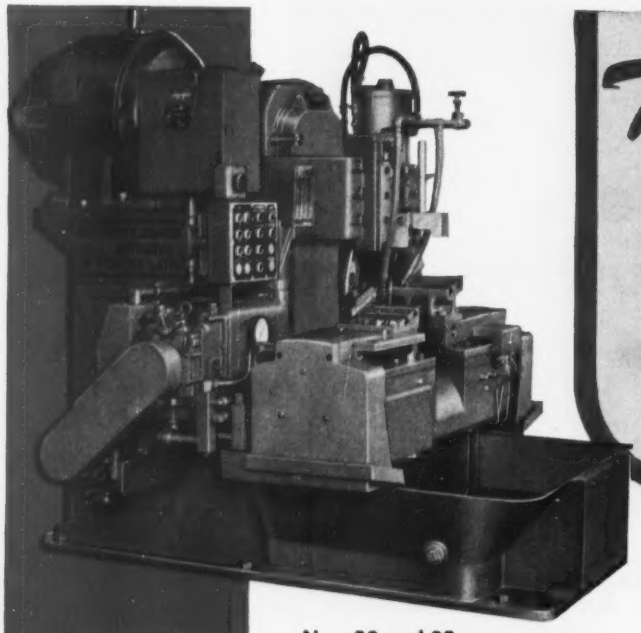
W—1515

NORTON
ABRASIVES

Making better products . . . to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

(For more information on products advertised, use Inquiry Card page 245)

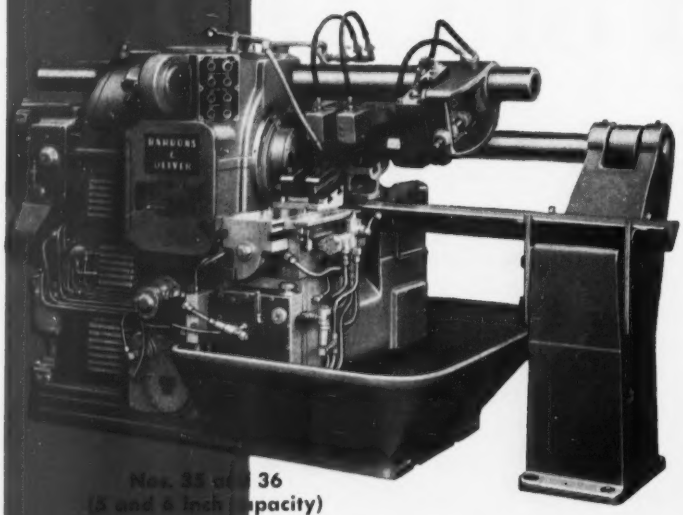


Nos. 38 and 39
(8 and 9 inch capacity)

The WORLD'S Manufacturer CUTTING-OFF

★ FULL AUTOMATIC ★
★ HAND OPERATED

BARDONS & OLIVER, work rotating type, cutting-off lathes are designed and engineered for *maximum* production. Rigid construction, hydraulic feeds, anti-friction bearings, heat treated alloy steel gears, hardened and ground steel ways, are only a few of their features.



Nos. 35 and 36
(5 and 6 inch capacity)



Nos. 33 and 34
(3 and 4 inch capacity)

BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO

Foremost of . . .

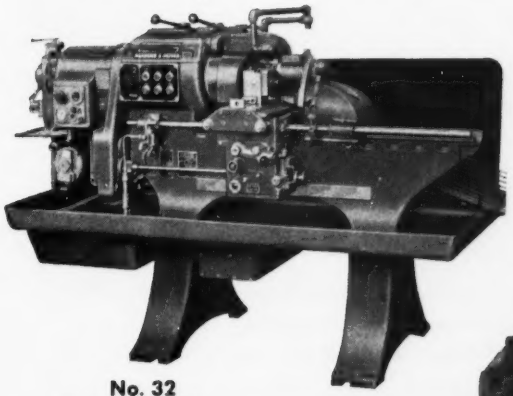
LATHES

SEMI-AUTOMATIC



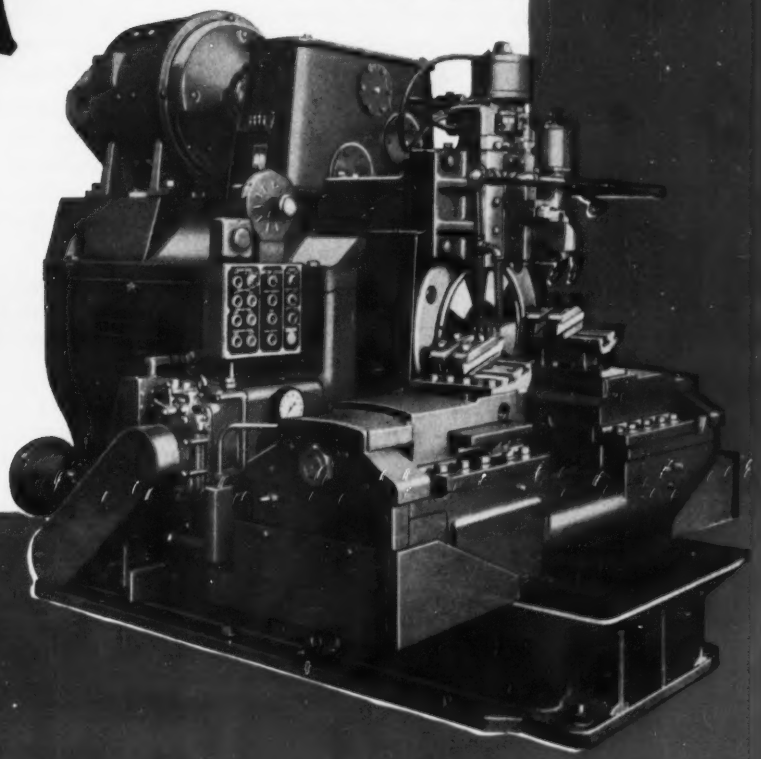
Loading Tables
(All Sizes)

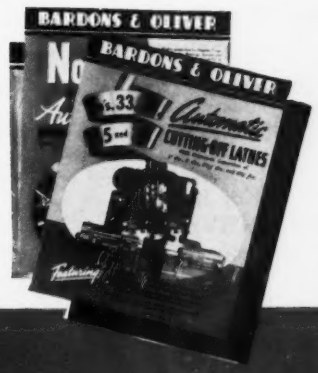
Automatic loading of the Cutting-off Lathes greatly reduces the cost of machining coupling blanks, nipple blanks and many similar parts made from tubing or pipe. The loading table has capacity for an average bundle of pipe or tubing. By using these automatic tables it is often possible for one man to operate two Cutting-off Lathes.



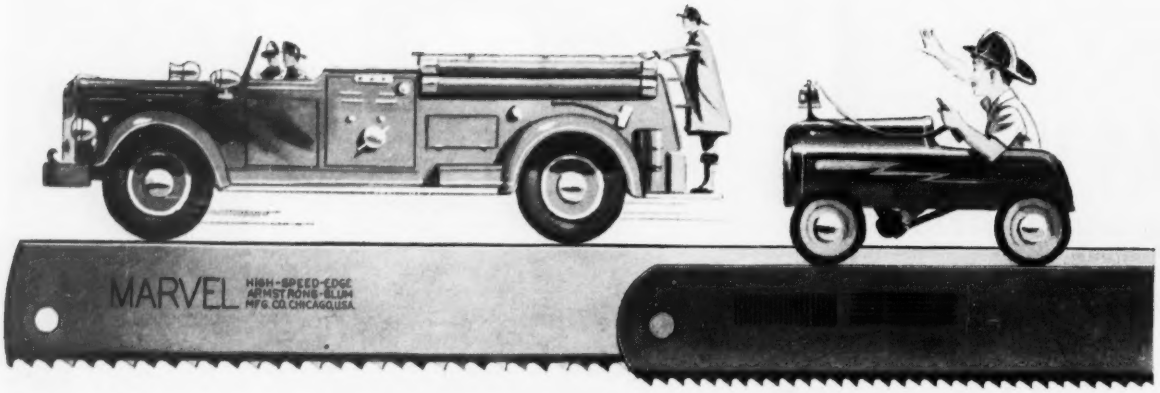
No. 32
(2 inch capacity)

Nos. 314 and 316
(14 and 16 inch capacity)





Write for complete information on the most complete line of cutting-off lathes ever offered. (Please specify size and nature of your work.)



. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

MARVEL *Metal Cutting* SAWS

Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • Chicago 39, U. S. A.

(For more information on products advertised, use Inquiry Card page 245)



...delivers high production-low cost carbide planing!

Here's high production — low cost carbide planing at the Beloit Iron Works, Beloit, Wis.

This GRAY OPENSIDE PLANER CUB is running 300' per minute, day in — day out, carbide planing packing strip holders for suction rolls of paper making machinery.

BETTER BE QUICK!

Planer jobs don't grow old on a GRAY!

Ever see a planer running wide open, day after day at 300' per minute? That's the pace of a new GRAY — the pace that makes your old planer look really old.

Why should you be interested?

Because a GRAY CUB is not only an economical initial investment — it also insures substantial savings in time and money thru its high speed, accurate production ability.

Write today—get the story on GRAY

HIGH LOW COST PRODUCTION

The G.A. **GRAY** *Company*

DEPT. B

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

(For more information on products advertised, use Inquiry Card page 245)



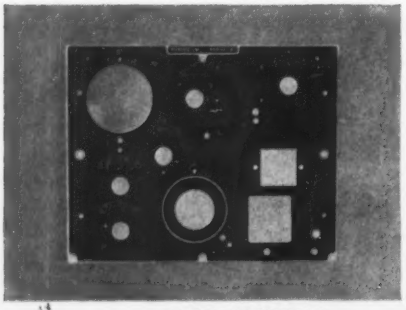
HOME HEATING UNITS
Timken Silent Automatic Div.
Jackson, Mich.



FOOD PREPARATION and SERVING EQUIPMENT
Southern Equipment
Company, St. Louis, Mo.

these companies
precision-punch
parts in
small lots
with
low cost
tooling
on

WIEDEMANN TURRET PUNCH PRESSES



METAL SPECIALTIES
L. F. Grammes & Sons, Inc.
Allentown, Pa.

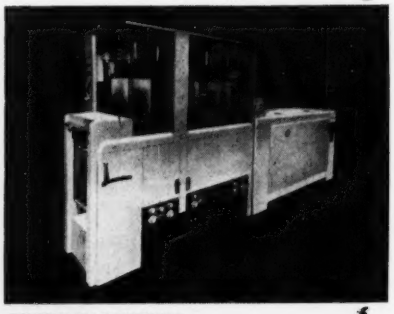
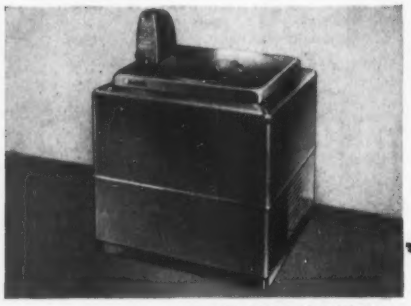


PHOTO PROCESSING EQUIPMENT
Pako Corporation
Minneapolis, Minn.



VENDING MACHINES
The Vendo Company
Kansas City, Mo.



COMMERCIAL REFRIGERATORS
C. V. Hill & Company, Inc.
Trenton, N. J.

you can do the same • ASK FOR A TIME STUDY

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Avenue, Philadelphia 32, Pa.

(For more information on products advertised, use Inquiry Card page 245)

Here's one you'll want to bite on!

It's Formbrite



Upper lure is Formbrite. Lower one is made of ANACONDA Fancy Pattern Embossed Brass.

Thirty-five years ago a fisherman, disgusted with his luck, cut up an old brass bait box to make himself a spinner resembling an old-time airplane propeller. Both fish and fisherman liked it so much, he started what is now a big and thriving business. ®Reg. U.S. Pat. Off. 5392

FISH find this particular line of brass spinners so attractive that fishermen's demands have built annual sales of the Aeroplane Tackle Manufacturing Company of Denver to more than two million lures of all types.

The high finish on the spinner is part of the secret. While the cost of producing this is of no interest to the fish, it is to the manufacturer. Recently all brass orders were changed to Formbrite®, the superior ANACONDA Drawing Brass that has enabled this firm to cut polishing costs over 25%, and on several stamped products to produce the required finish by tumbling only prior to lacquering or plating.

Formbrite, with its superfine grain, provides a surface far superior to ordinary drawing brass. It is stronger, harder, more scratch-resistant than ordinary brass, yet retains remarkable ductility for forming and drawing. It's a premium product at a non-premium price. If these features lure you, we should like to show you how this better brass can cut your product's finishing costs. Or write for Publication B-39 to *The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.*

Formbrite

DRAWING BRASS

An ANACONDA® product made by The American Brass Company

(For more information on products advertised, use Inquiry Card page 245)



UNIVERSAL DRILL BUSHINGS

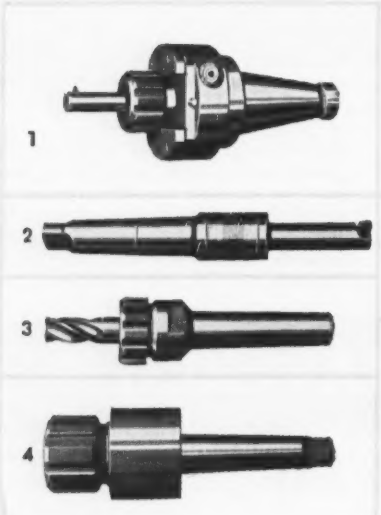
the production-tools' best friend

reduce tool wear
help prevent
tool breakage

prolong
tool life

Universal Bushings help keep tool costs down for several reasons: their superfinish bore helps reduce tool wear • their blended radius helps prevent tool hang-up and breakage • their 100% concentricity and hardness tests insure accuracy and uniform high quality • their knurled heads provide quick, sure grip • available in a complete range of standard diameters and lengths • orders for special dimensions will be handled promptly • For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Avenue, Kenosha, Wis. — or the home office.

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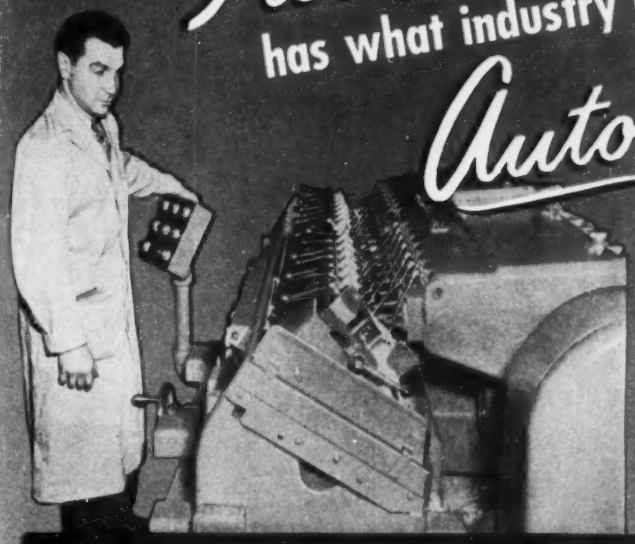
UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 2
MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

(For more information on products advertised, use Inquiry Card page 245)

Turchan has what industry needs in the trend to Automation

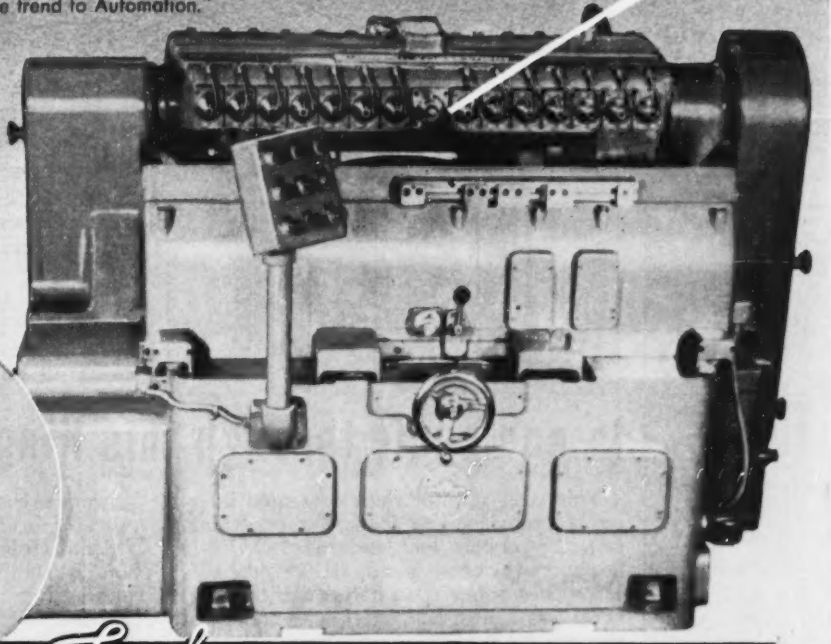


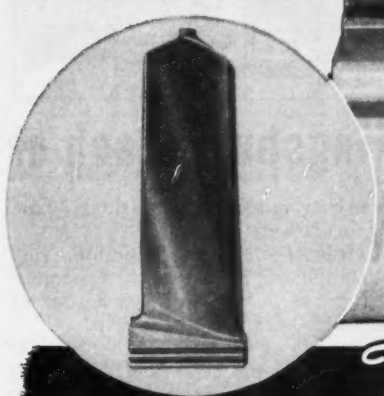
tracer-controlled multiple spindle machine automatically mills 14 jet engine compressor blades simultaneously

MILLING ACHIEVEMENT!

Extensive research into turbine blade production by leading aircraft designers resulted in this 14-spindle duplicator. Manufactured by Modern Tool Works, Ltd., it's an outstanding example of how Turchan tracer-controls are fitting into management's plans for automation of standard and special machines. Production time and cost per unit are slashed to a minimum, highly skilled manpower shortages are eliminated when you "turn to Turchan in the trend to Automation."

Tracing from a master the desired contour is machined by hydraulic control on 14 blades to accuracies and finishes that reduce final operations to minimum.

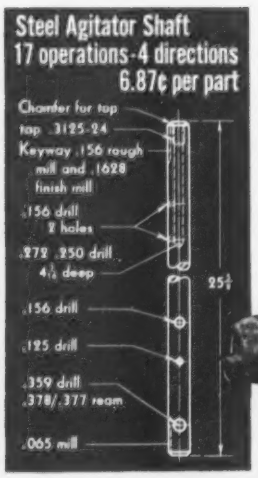




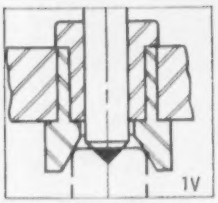
Turchan FOLLOWER MACHINE CO.

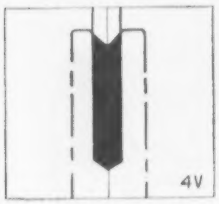
8259 Livernois Avenue • Detroit 4, Michigan

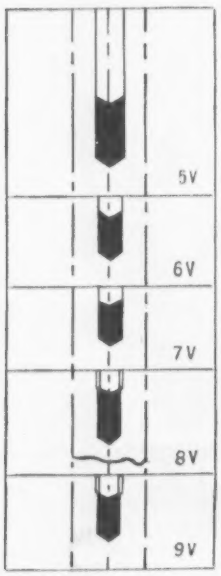
Combine Operations on a Kingsbury and turn

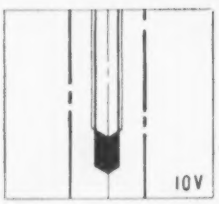


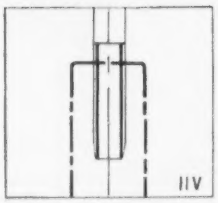


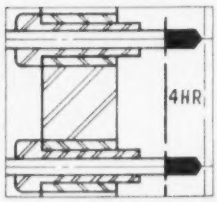


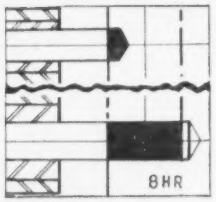












In one cycle through this Kingsbury, each of

This steel agitator shaft presented interesting problems: its shape, for one thing. It is 25⅝ inches long and ⅞-in. O.D. It has a keyway at each end, and an axial hole 4⅝ inches deep. Two ports enter this hole at 90°, and three horizontal holes are drilled through the shaft at 90° to these ports.

The Kingsbury has 11 units and an air-operated stamp mounted on the central column. Six units are mounted on the base; 12 work-holding fixtures are mounted on the 60-in. index table. Each fixture presents its work to cutting tools at 11 stations. One operator loads and unloads.

Axial Hole: To speed production, this hole is completed in 9 steps. Customer allowed these steps to vary from a start of .272 dia. to .250 dia. — a great help!

Unit IV: .343 at 45° spot for countersink. Sliding drill bushing carrier is piloted to top of work for concentric start of hole.

Drilling Units: 4V thru 10V complete the hole to a depth of 4⅝ inches.

Unit IIV .3125-24 taps hole ¾-in. deep.

out many parts per hour at low cost per part

You can combine your drilling, c'boring, reaming, tapping, light milling, recessing, spotfacing or threading operations — and reduce your costs.

Your part can be of any metal or material that can be machined economically. It must be of a size and weight which can be machined within the limits of 5 HP units and be handled efficiently by your operator. You must want a lot of parts per man-hour, because you'll get high production.

You'll get uniform accuracy. Your scrap loss will be reduced to a minimum. You'll save floor space. You'll eliminate re-handling. In fact, you'll be very happy about the whole thing!

Now, a word about the costs quoted in this advertisement. These costs amortize the entire Kingsbury investment over 6000 hours. This is a fraction of its useful life! They include the cost of the man and machine, but no power or overhead.

They assume unit cost of the man to be:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross X 80\% efficiency}}$$

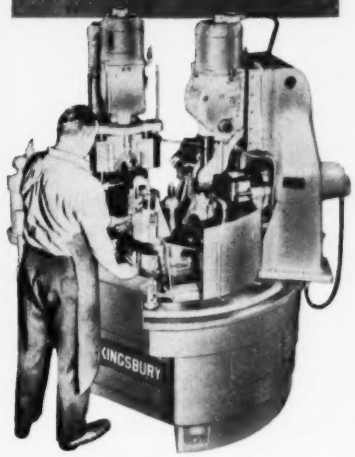
They assume unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. at 80\% efficiency}}$$

Each Kingsbury machine is custom-built to do a specific group of jobs — and is given a trial run for your approval of the machined part before delivery. Are you really interested? If so, we'd like to see you.

Kingsbury Machine Tool Corp.
103 Laurel St., Keene, N. H.

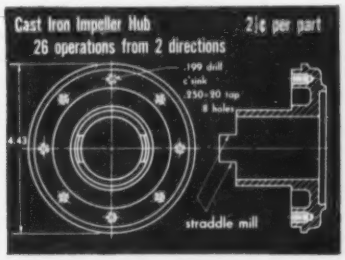




← Steel Transmission Sleeve

350 parts per hour gross—1-4/10¢ each

Note plan view drawing — it shows the angles. Four work fixtures are located on a 20-in. index turret. All work is performed at three stations. Two horizontal and two vertical drilling units are mounted on the 60-in. base. One vertical drilling unit has a milling attachment with side adjustment to compensate for cutter wear. Work fixtures are unclamped automatically at the unloading station.

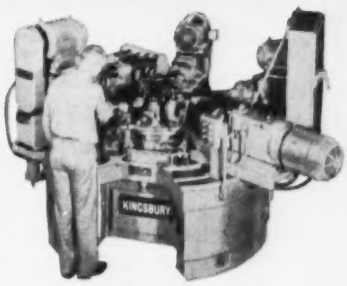


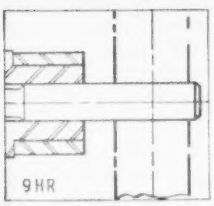
Cast Iron Impeller Hub →

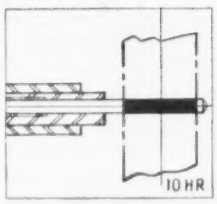
204 parts per hour—2½¢ each

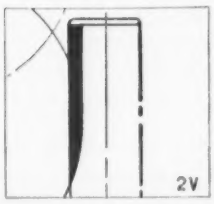
In this Kingsbury the units are located on the 80-inch base, and the work fixtures on a 26-in. turret. There are 8 stations.

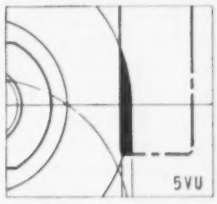
The machine performs 26 operations. Eight holes are drilled, c'sunk and tapped. But the milling operation is the most interesting. A milling unit is attached to a drilling unit equipped with a 7-in. stroke attachment. Cutters feed from right to left through the work, straddling the material.











12 parts receives 17 operations from 4 directions

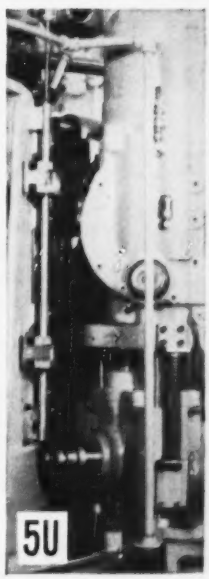
Horizontal Holes: Drills are located accurately by sliding tool guide bushing carriers piloted to each work fixture.

Unit 4H (right) has a 2-spindle auxiliary head — drills two .156 holes thru into axial hole on center line of keyway. *Unit 8H* (right) operates 2 spindles — drills .156 and .359 through shaft. *Unit 9H* (right) reams the .359 hole to .378/.377 diameter. *Unit 10H* (right) .125 drills through.

Keyways: At top of shaft, .156 wide keyway is rough- and finish-milled by units at 2V and 3V. At bottom of shaft keyway is milled .065 wide by *Unit 5U* (under), as shown in photograph at right. All milling units can be adjusted to maintain accuracy.

* * *

At Station 12 (where operator loads and unloads the machine) an air-operated identification stamp works on top end of the shaft just prior to the unclamping of the work-holding fixture.



H. J.
Here's a really fantastic letter!
P.W.

BANNER TOOL COMPANY

BANNER tools DETROIT — *Fine* TOOLS FOR INDUSTRY

7243 FILER AVENUE - TWINBROOK 2-4900

DETROIT 12, MICHIGAN

June 16, 1952

Cities Service Oil Co.,
3049 E. Grand Blvd.,
Detroit 2, Michigan
Attention: Mr. P. E. Watts

Dear Sirs:

We called upon the services of your lubrication engineer, Mr. A. J. Blake, in reference to a serious staining condition which we were having with our soluble oil. He analyzed this condition and recommended one of your Chillo Oils. This oil was tried and the rust condition eliminated to our satisfaction.

To our surprise on his next visit he was dissatisfied with our tool life and suggested we use a soluble oil called "Chillo A". Now not only do we have clean machines, but tool life has been increased 20%! While in our plant he asked permission to "look around", which, of course, was granted.

We were using a tapping compound with precision ground taps in order to hold to close tolerances. We did not consider tap breakage excessive but the removal of broken taps was sometimes rather expensive. He recommended we use "Chillo 10Z". Then came the surprise of our lives! With Chillo 10Z we have gone to commercial ground taps (a 300% savings) and can still hold our same tolerances, with a sharper thread, increasing tap life a minimum of 20% plus eliminating expensive removal of broken taps!

We also have a production stamping job which required a new set of dies every month. On his recommendation we tried Chillo 10Z with these dies. Now our die life has increased to at least two months...a saving in die life of 100%, disregarding labor costs. We also increased production 200% per die sharpening!

We tried the same oil on our broaching operation and found that instead of making two cuts we can get the same results now with one. We were using one of your competitors' hydraulic oils and you told us it was a "good oil" and would give us satisfactory performance. BUT, GENTLEMEN, WITH THE EXCELLENT SERVICE YOU HAVE GIVEN, PLUS THE TIME AND MONEY SAVED, YOU MAY REST ASSURED THAT ALL OF OUR LUBRICATING REQUIREMENTS WILL BE PURCHASED FROM YOU.

Yours very truly,

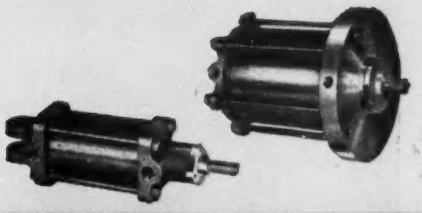
BANNER TOOL COMPANY

S. F. Olesak

S. F. OLESAK

SFO:sd

(For more information on products advertised, use Inquiry Card page 245)



Pneumatic Cylinders

Really complete, the Hannifin line of pneumatic cylinders is made in twelve bore sizes, 1" to 16", and in six standard mountings, many combination mountings. Really standard, these cylinders are tooled to tolerances that assure accurate mounting to make assembly to your machines easier. Really built, each cylinder is "TRU-BORED" and honed, piston rods are ground and polished, interchangeable end caps, heavy duty tie rods...rugged, yet precision construction throughout!

Write for Bulletin 210



NOW...

HANNIFIN HAS THE MOST COMPLETE LINE OF AIR CONTROL EQUIPMENT!

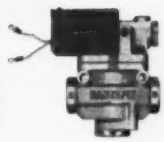
NEW! REVOLUTIONARY HANNIFIN *P-M Pilot-Master Valves*

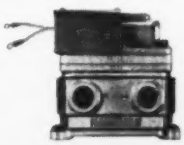
Piston-operated poppet design. Exclusive replaceable cartridge for easier maintenance. Speeds to 600 cycles per minute. Pressure from 15 to 150 p.s.i. Integral, solenoid-controlled pilot heads or a choice of 10 separate pilot valves for remote control.

- Fewer Valves to Stock
- Fewer Parts to Stock
- Maximum Interchangeability
- No Springs in Main Valve

Write for Bulletin 231.

2 and 3-Way Valves.
Same valve operates 2-way or 3-way, normally open or normally closed. ⅜" to 1¼" I.P.S.



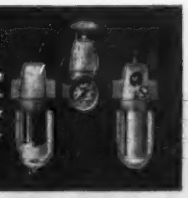


4-Way Valves.
Two 3-way valves mounted in compact, common body. Two piston poppets. Two cartridges. ⅜", ½", ¾" I.P.S.

EXCLUSIVE REPLACEABLE CARTRIDGE



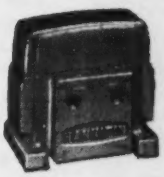
AIR WARDEN
Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 10108.



Disc Type Air Control Valves

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: ⅛" to 1¼" I.P.S.

Write for Bulletin 57-W



Hannifin "Directair" electrically controlled air-operated disc valve



Foot-operated treadle valve (Also spring return and rotary types)



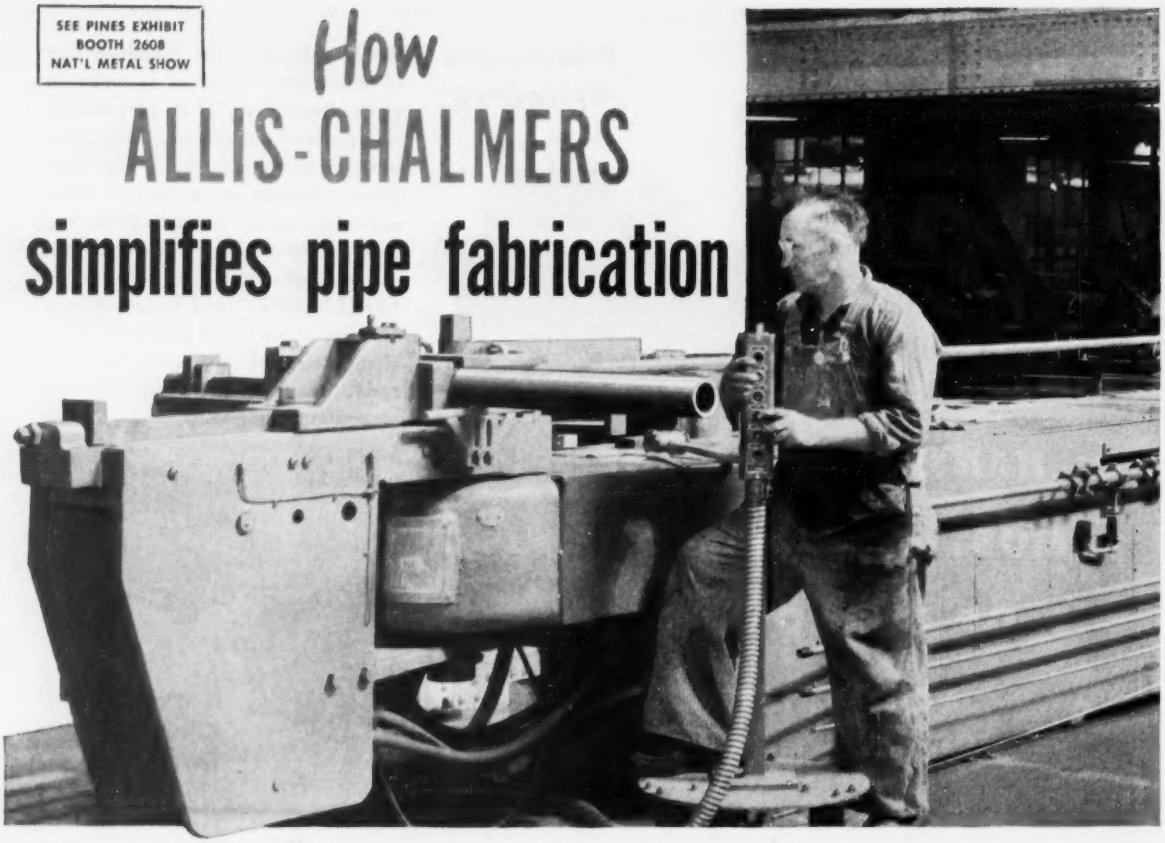
Standard hand control valve (Single or duplex)

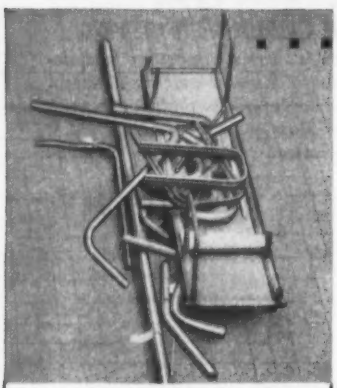
HANNIFIN

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Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

SEE PINES EXHIBIT
BOOTH 2608
NAT'L METAL SHOW

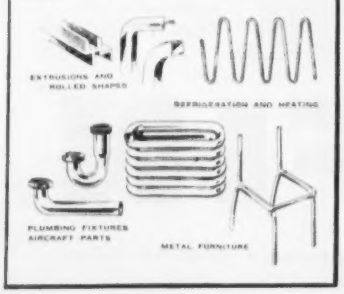
How ALLIS-CHALMERS simplifies pipe fabrication





View of small lot bending jobs performed on Pines Size 4 Automatic Bender. Smooth, accurate bends are formed without wrinkles or distortion.

OTHER TYPICAL PINES BENDING JOBS
There's a complete range of Pines Benders designed to profitably handle jobs like these.



. . . with a PINES AUTOMATIC BENDER

Cold Bending Eliminates Costly Pickling Operation

In a centralized pipe fabricating division at the Allis-Chalmers West Allis Works, a wide range of cold bending jobs for production and maintenance needs are now efficiently handled on this Pines Hydraulic Automatic Bender. The machine has ample capacity for handling requirements for pipe and tubing ranging in sizes from 3/4″ thru 5″. The cold bending principle of the machine, combined with push-button control and automatic operation, reduces manual effort, and cuts costs. *For example,* in place of hot bending, long lengths of 3″ oil line piping are now cold formed at speeds five times more efficient. In addition, a costly cleaning and pickling operation is avoided.

Small Lots Handled Profitably—Low Tooling Expense

Further, most small lot jobs are handled profitably. The centralized operation permits standardizing on radii of bends which lowers tooling expense. Simplicity of tooling and quick change-over features of the machine saves set-up time. The capacity and versatility of the equipment also permits handling all types of materials and shapes suitable to cold bending, such as stainless steel and chrome-moly tubing, extra heavy wall piping, channel iron, extruded and structural shapes. Thus, with modernized equipment and skillful engineering, fabricating and assembly work at A-C are greatly simplified.

PINES ENGINEERING CO., INC.

Write **FOR MORE FACTS TODAY**

Find out how Pines Benders may be tooled for your work. Free catalog shows various models and tooling applications on actual jobs.



Specialists in Tube Fabricating Machinery

687 WALNUT • AURORA, ILLINOIS

BENDING • DEBURRING • CHAMFERING • THREADING • CUT-OFF MACHINERY

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SCENE 114:
"3 Taps in 1"
... an actual scene from the GTD-Greenfield sound film "FACTS ABOUT TAPS AND TAPPING"
VOICE: "Sometimes a very special tap is the only solution to a difficult threading problem . . . Here we see a special tandem tap designed by GTD-Greenfield engineers to enable a pump manufacturer to tap three concentric holes in one operation . . . Special taps may far offset higher initial cost in greater production on the job."
GREENFIELD
TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
This 26-minute full-color motion picture "FACTS ABOUT TAPS AND TAPPING" is now available for group showing through your local GTD-Greenfield distributor.



THAT'S JUST THE POINT!

. . . . Yes, but a mighty important part of any Twist Drill. That's where the first contact comes, that's where hole size, roundness and surface smoothness are made or lost. That, in short, is the heart of the drilling operation.

GTD-AMPCO Drills are made with special attention to point accuracy, but behind the point you'll find that GTD-AMPCO Drills are exceptional for concentricity of flutes and lands, regularity of margins, polished flutes for better chip slippage, *and* in sizes over 1 inch the exclusive GTD-Ampco feature . . . they're HAMMER-FORGED for extra toughness and longer wear life.

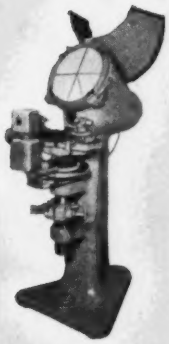
AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

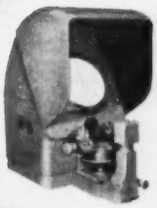
GREENFIELD, MASS.

11 MODELS

3 SCREEN SIZES



Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models



Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

JONES & LAMSON OPTICAL COMPARATORS

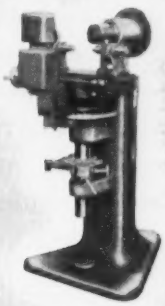
The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

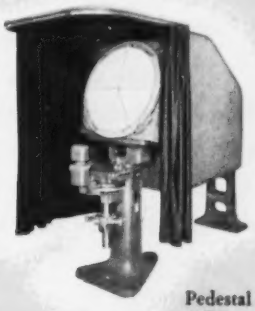
- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
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- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
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14" Diam. Screen



Direct
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Pedestal Type
30" Diam. Screen



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Please send Comparator Catalog No. 402.

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Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
512 Clinton St., Springfield, Vt., U.S.A.

J&L COMPARATOR DIV.
Dept. 710

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HOW TO PLACE Engineers ON YOUR Production Line

If you want:

more production with less human effort . . .

fewer rejects and less scrap . . .

closer limits on tolerances . . .

less maintenance costs . . .

less downtime . . .

then you must have PRODUCTION-LINE ENGINEERING.

Whether you are removing substantial amounts of stock or just a few tenths of thousandths of an inch, economical "precision production" is your goal. The Microhoning process gives you stock removal, geometry (roundness and straightness), size control and uniform surface finish. Micromatic Hone Corporation maintains a staff of experienced field and design specialists who are ready to offer you complete engineering service in your processing problems on cylindrical or flat surfaces. Learn how you can have a combination of precision and speed on your production line. Just contact our office nearest you.

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MACHINE TOOL CORPORATION

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ROCHESTER, NEW YORK

BAY STATE...

BEST BECAUSE: *You get . . .*



FAST CUTTING ACTION

Experienced selection of best abrasive grain types, plus scientific blending of grain sizes, assures the optimum rate of cut for low-cost cylindrical grinding.

CONTROLLED POROSITY

Uniform cutting action — wheel-to-wheel, day in and day out on the job — is assured by the "Controlled Porosity" method used in the manufacture of BAY STATE cylindrical grinding wheels.

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BAY STATE's exclusive FRACTIONAL GRADES permit selection of the exact grade for your job by splitting each normal grade into three degrees of hardness. BAY STATE wheels are not too hard, not too soft . . . but precisely correct to give maximum production in the shortest possible time.

UP-TO-DATE BOND DEVELOPMENTS

Constant laboratory research and field engineering keep BAY STATE wheels "abreast of the times" on bond requirements. For shoulder-grinding, for example, your BAY STATE wheel will have the right bond strength for maximum safety and form throughout its long, useful life.

ABRASIVE WHEEL INSTITUTE MEMBER

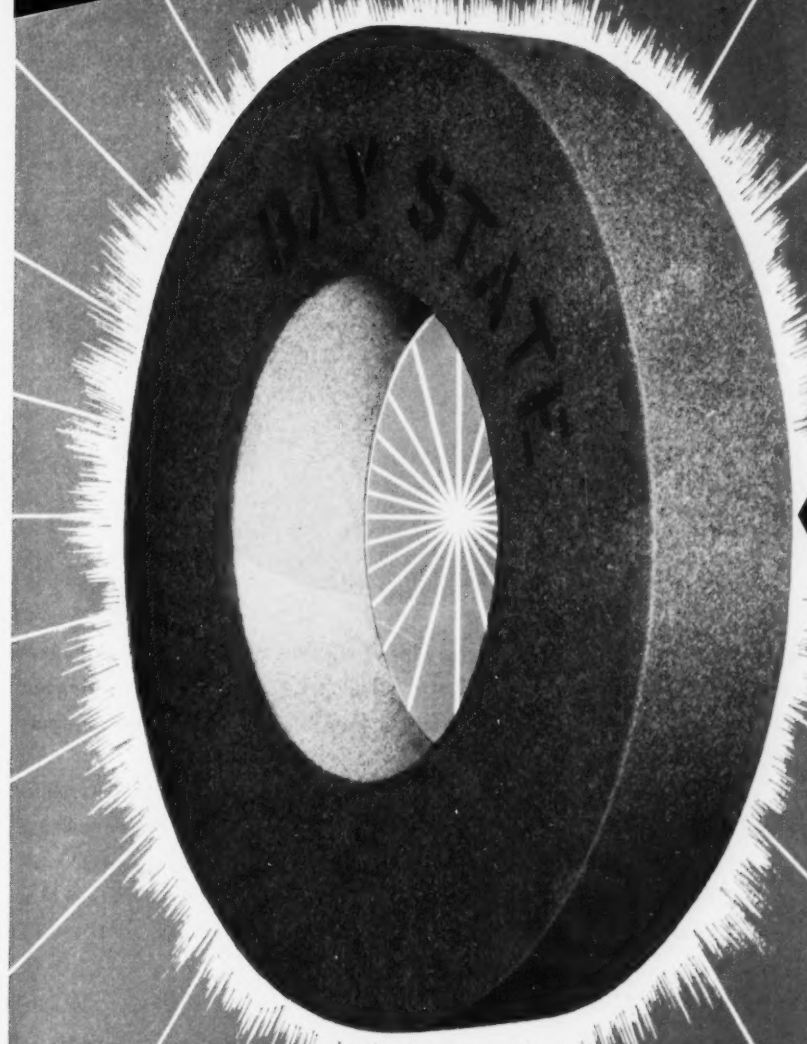
BAY STATE

Send For Your Cylindrical Grinding Wheel Brochure

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

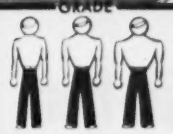
Branch Offices and Warehouses:
Chicago, Cleveland, Detroit, Pittsburgh.
Distributors: All Principal Cities.
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

CYLINDRICAL GRINDING WHEELS!



1/3 GRADE SOFT | 1/3 GRADE EXACT | 1/3 GRADE

IMPORTANT FACTOR



EXACT SPECIFICATION

Exclusive FRACTIONAL GRADES give you THREE choices of hardness within a single "normal" grade. You can get the wheel that's exactly right . . . from BAY STATE.

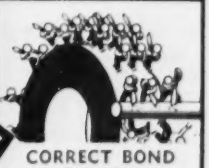
IMPORTANT FACTOR



UNIFORM SPACING

of abrasive particles for consistent cutting action BAY STATE gives you complete uniformity in every wheel through CONTROLLED POROSITY.

IMPORTANT FACTOR



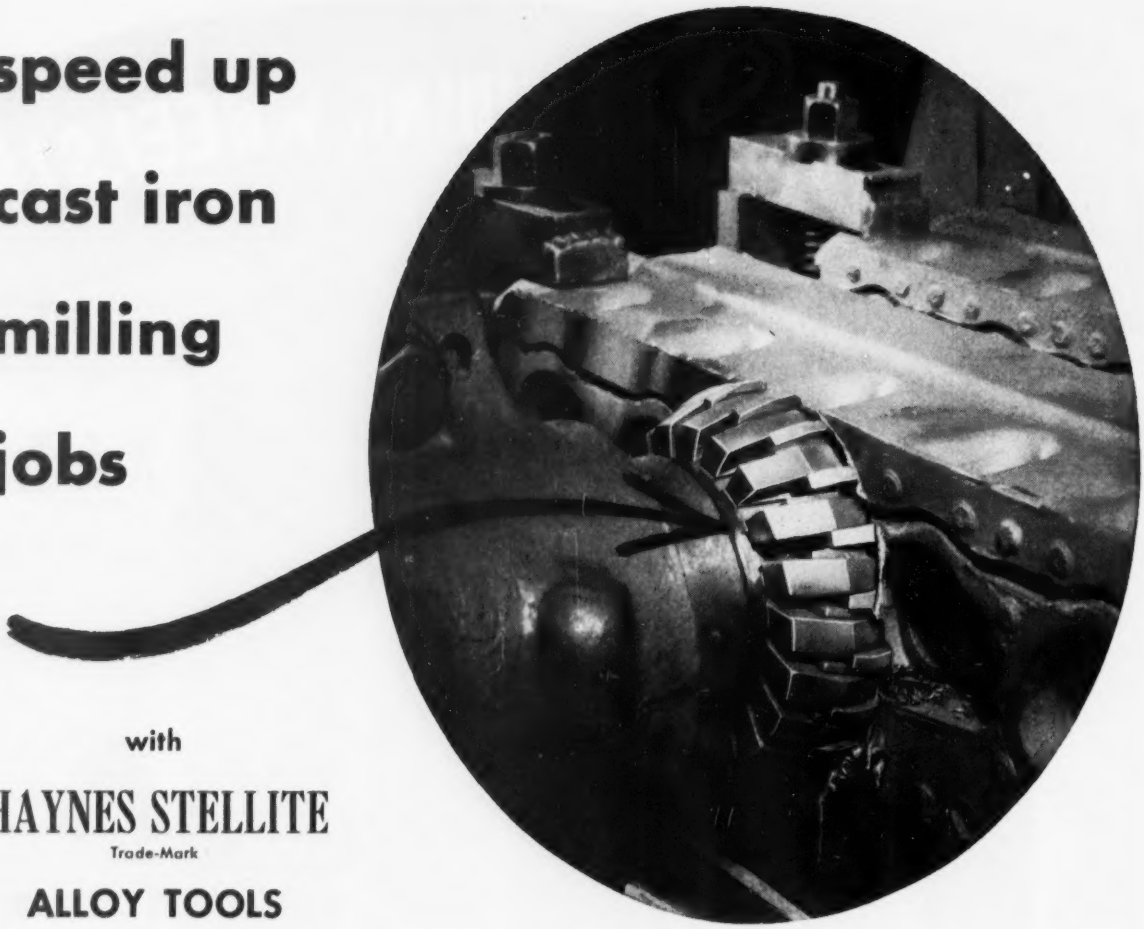
CORRECT BOND STRENGTH

for each metal ground. Every abrasive particle must stay in place until it has done its job. Then, and only then, it must be released to let the next new particle "go to work".

YOU CAN GRIND BETTER WITH BAY STATE

BAY STATE

speed up cast iron milling jobs



with

HAYNES STELLITE
Trade-Mark

ALLOY TOOLS

High compressive strength at cutting temperatures . . . good impact strength . . . and extremely low frictional coefficients make HAYNES STELLITE alloys ideal tool materials for cast iron milling jobs.

Two hard grades of HAYNES STELLITE alloy are available for milling cast iron at high speeds. On soft cast iron (less than 185 Brinell), these tools can take light milling cuts at speeds up to 300 surface ft. per min. For heavy milling, speeds up to 250 surface ft. per min. can be used.

Hard cast iron up to 240 Brinell can be milled at speeds as high as 200 surface ft. per minute. Safe chip loads range up to 0.025 in. per tooth.

Tougher grades of HAYNES STELLITE alloy are available for efficient milling of castings that have irregular contours, surface imperfections, or inclusions, or where there are variations in chill depth.

HAYNES STELLITE alloy tools are available as fabricated shell-end mills and as insert milling-cutter blades. The different grades of alloy can be used for a wide variety of milling conditions. If you wish help on your own particular milling problems, write to the nearest Haynes Stellite Company office.

For a copy of the new manual, "HAYNES STELLITE Metal-Cutting Tools," write to our General Offices.

HAYNES
TRADE-MARK
alloys

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NOW

more sizes of...

Stainless Socket Cap and Set Screws

Available in stock from your Allen o Distributor

Demand for rust and corrosion resistant socket screws of high finish 18-8 stainless steel has been increasing steadily for ten years.

Allens have become the leading make because of the inherent advantages of Allen manufacturing methods, and because Allen Distributors carry the widest range of sizes as standard stock items – saving their customers time and money.

Now Allen widens its margin of leadership with still more distributor-stocked standard sizes in stainless:

97 Standard Sizes in Stainless Steel Socket Cap Screws

#4 x ¼" to ⅝" x 3" with NC threads
#10 x ⅜" to ⅝" x 1½" with NF threads

54 Standard Sizes in Stainless Steel Socket Set Screws

#4 x ⅛" to ½" x 1" with NC threads
#10 in lengths from 3/16" to ¾" with NF threads

ALLEN

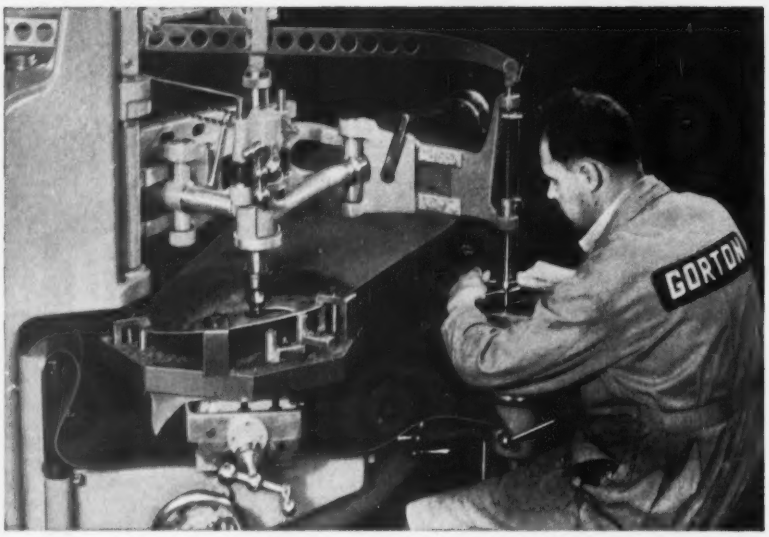
MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.



NEW

Grip-head Stainless Steel cap screws for more convenient handling and easy, time-saving starting.

Sold only through leading industrial distributors



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

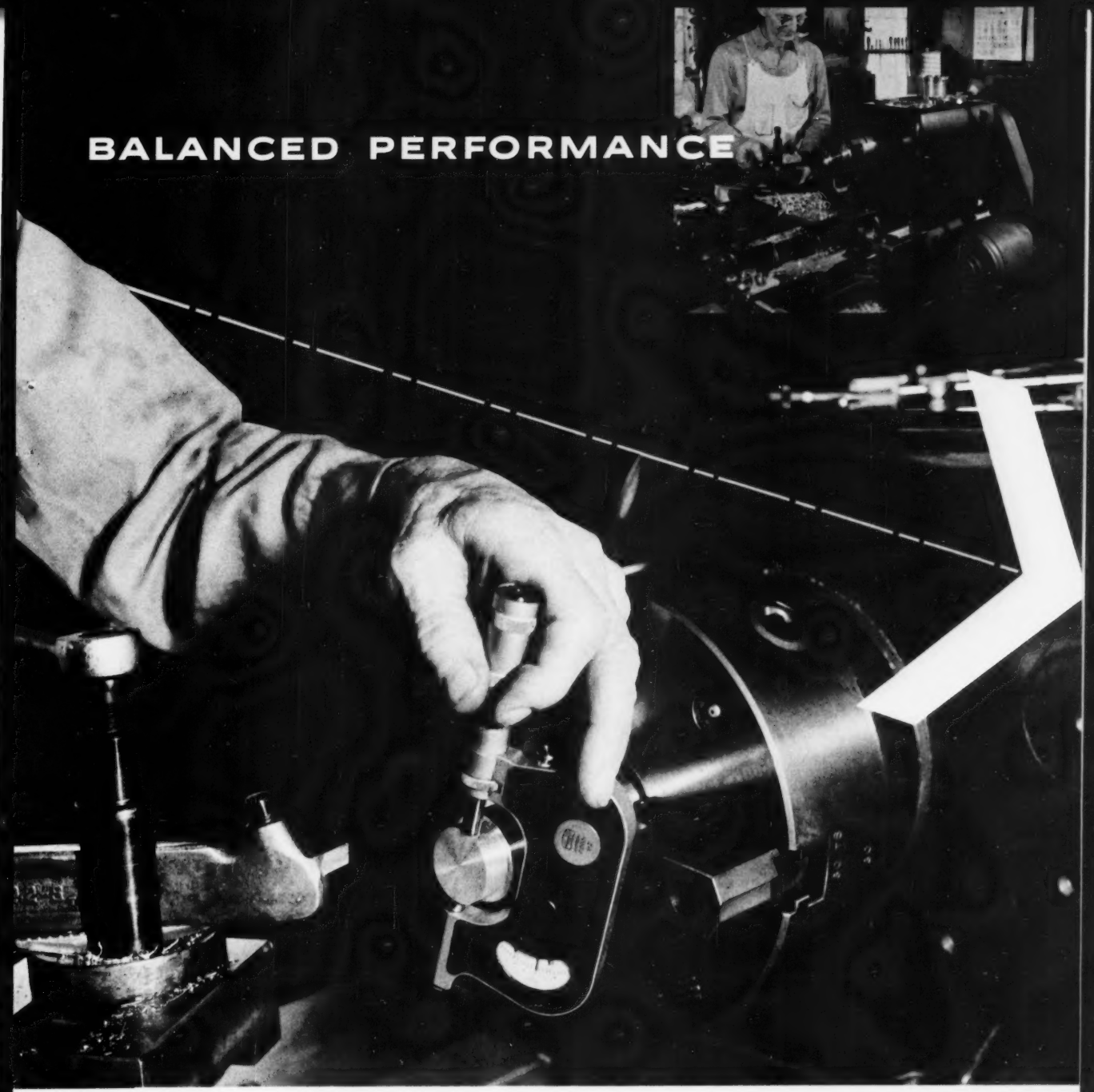
This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1310 Racine Street, Racine, Wisconsin, U. S. A.



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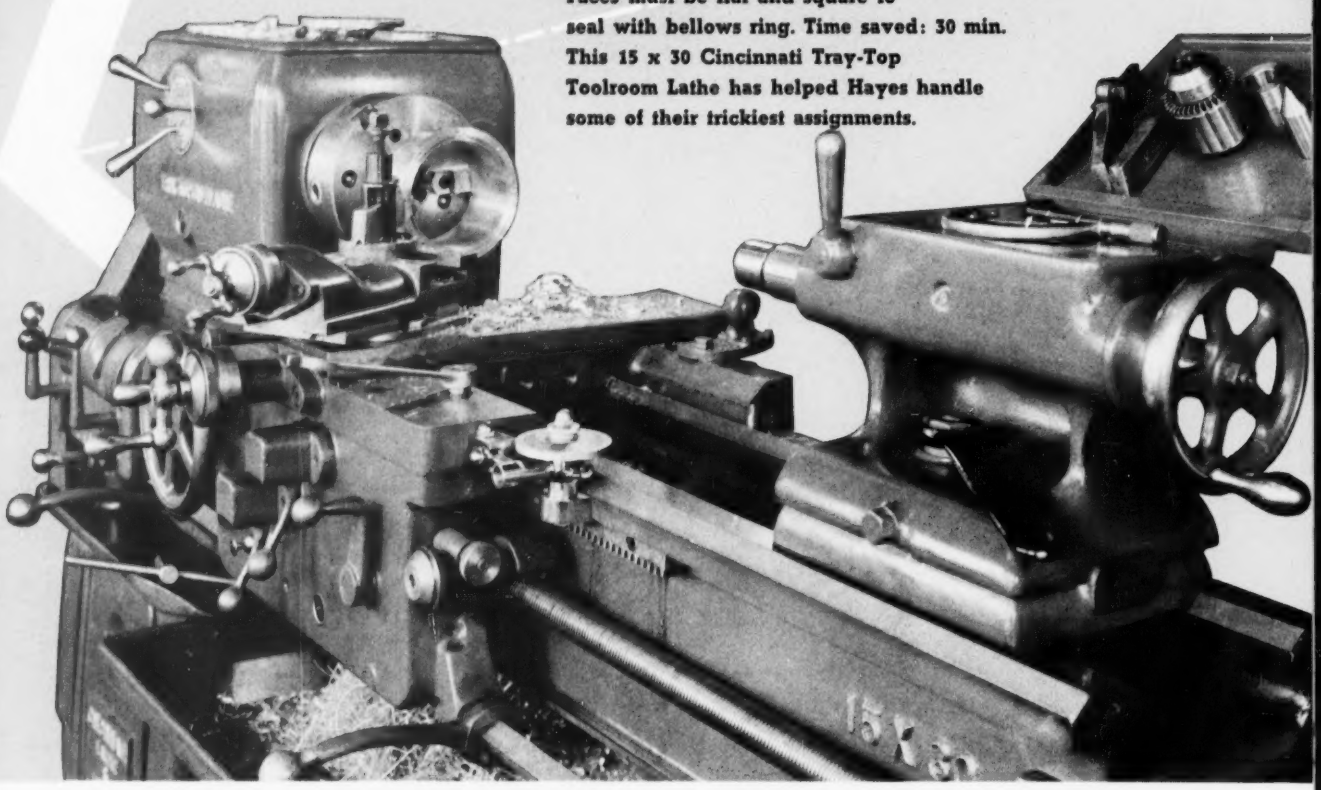
Hayes Scientific Appliances, Urbana, Illinois, often checks work done on their Cincinnati Tray-Top Toolroom Lathe with Zeiss Micrometers, and gets results consistent with inspections with gage blocks on a comparator! This, we think, is dramatic proof that you can do fancy lathe work on Cincinnati Tray-Tops at un-fancy prices. Ask your nearby dealer to show how and why balanced design Cincinnati Tray-Tops deliver important bonuses in precision as well as production.

best buys in their class!

CINTILATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

PRECISION PLUS | AND LOW COST



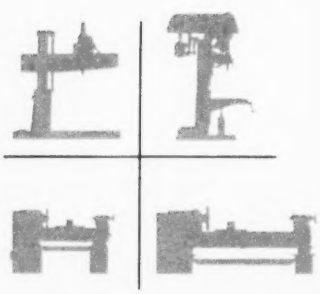
The part: bronze cap for vapor condenser, made by Hayes Scientific Appliances. Tolerances: fit to cylinder within .0003. Faces must be flat and square to seal with bellows ring. Time saved: 30 min. This 15 x 30 Cincinnati Tray-Top Toolroom Lathe has helped Hayes handle some of their trickiest assignments.

CINTILATHES: The complete, balanced line;
Tray-Top for light duty (engine, toolroom and gap bed models);
10", 12½", 15", 18" sizes; 18" to 114" center distances.
Model LT for medium duty (engine and gap bed models).
16", 18", 20", 24" sizes; 30" to 264" center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

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CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.



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Every time—count upon

MOTCH & MERRYWEATHER Engineering for a

clear advance in MACHINE TOOL DESIGN



Each machine tool built by us is charged with doing a specific job better than before and for less. To us that is a privilege—a challenge—an obligation. Every machine developed by the Motch & Merryweather engineering staff must earn a permanent place for itself in Industry—must contribute permanently to a nation's advance in point of efficiency and economy—must mark a visible step forward in machine tool design and construction . . . An example is outlined on this page.

This M & M duplex production single-purpose milling machine mills two tractor side bars while two others are being loaded (removing at same station). Actually mills 70% of the time; up to 268 side bars per hour @ 100%. Two heads move, not the operator. Rigidity and power (30 h.p.) hike output. Fixtures to suit.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

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RECENT INTERESTING DESIGNS



Aircraft strut part. Wt: 8¼ lb.

Fulcrum for internal combustion engine. Wt: 4 lb.



from the Bethlehem Drop Forge Shops

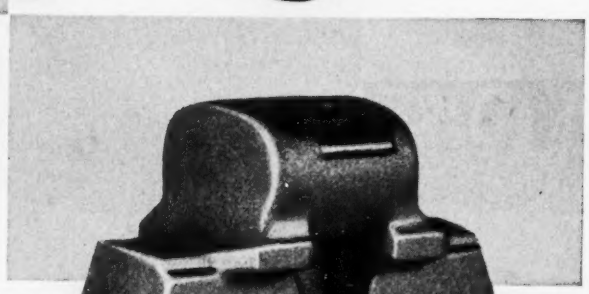


Arm for aircraft aileron control. Wt: 6½ lb.

Blank for high-speed



gear. Wt: 2½ lb.



Link used in coal cutter. Wt: 26½ lb.

Every working day of the year the Bethlehem drop forge shops turn out a steady stream of interesting designs; some simple, some complex, but all produced with the same exacting care. A recent group is pictured here, and as you can see, the pieces are meant for use in widely different industrial fields.

These of course are but a few—a tiny fraction—of the huge number of sizes and types that Bethlehem makes. We are equipped for closed-die forgings ranging in weight from several ounces to well over 200 lb—forgings available in carbon or alloy steel, untreated or heat-treated.

Why not let us see prints of the next design you expect to order? We handle all production details, including the sinking of the dies, in a way to please the most particular buyer.

Bethlehem facilities for the making of closed-die forgings include steam and board drop hammers, 1500 to 8000 lb; mechanical presses to 3000 tons; upsetters 9 in. and smaller.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

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(For more information on products advertised, use Inquiry Card page 245)

If You Use Or Sell *Electric-Weld* Tubing



in considerable quantities, you undoubtedly have asked yourself: "Couldn't we profitably *make* it ourselves?"

How much does a mill cost? What sizes will it make? Labor and operating skill required? Daily output in feet or tons? Break-even point of a mill? Strip supply? Power cost? Maintenance?

The new Yoder Tube Mill Book discusses these and other pertinent subjects. It's a realistic story of one of the most interesting developments in modern metal working . . . a development which started only 15 years ago, with the introduction of the amazingly efficient new Yoder electric resistance tube welder with rotating transformer.

Since then, the advantages inherent in the tubular shape, in looks, high strength and light weight, have profoundly affected product design, and so multiplied the uses that the demand has always been three steps ahead of the supply.

Literature, Consultations, Estimates for the asking.

THE YODER COMPANY

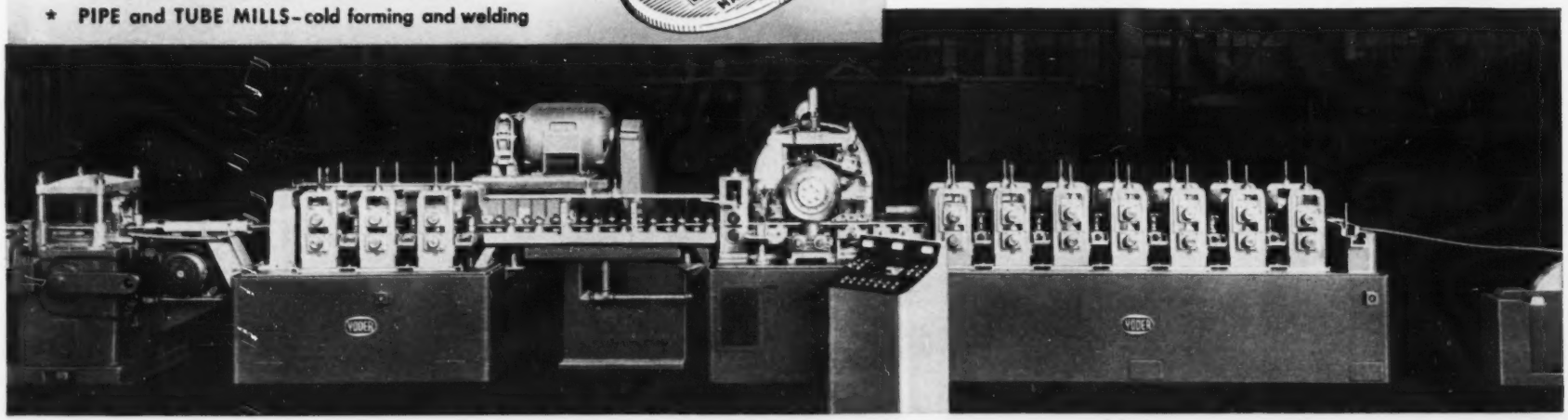
5504 Walworth Ave.

Cleveland 2, Ohio

Complete Production Lines

- ★ **COLD-ROLL-FORMING and auxiliary machinery**
- ★ **GANG SLITTING LINES for Coils and Sheets**
- ★ **PIPE and TUBE MILLS–cold forming and welding**

ENGINEERING YODER MANUFACTURING



We have just one axe





CARBO

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

to grind . . . YOURS !

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take snagging, for instance. With abrasives there are at least 9 different ways to remove stock at high rates. That means the odds are 9 to 1 there's a better, lower cost way than the one you're using now. How can you be *sure?* By asking CARBORUNDUM . . . for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains . . . and only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

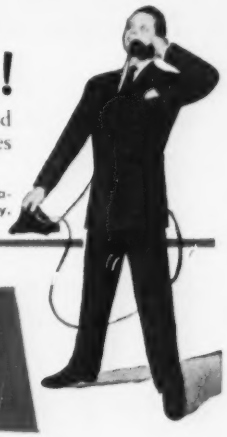
Or suppose you're manufacturing shears . . . you must remove scale with tumbling nuggets—finish with abrasive belts—sharpen with grinding wheels—polish with abrasive grain. CARBORUNDUM alone can give you *one-source control* of abrasive quality, on every type of abrasive you use . . . quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery . . . and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog . . . containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

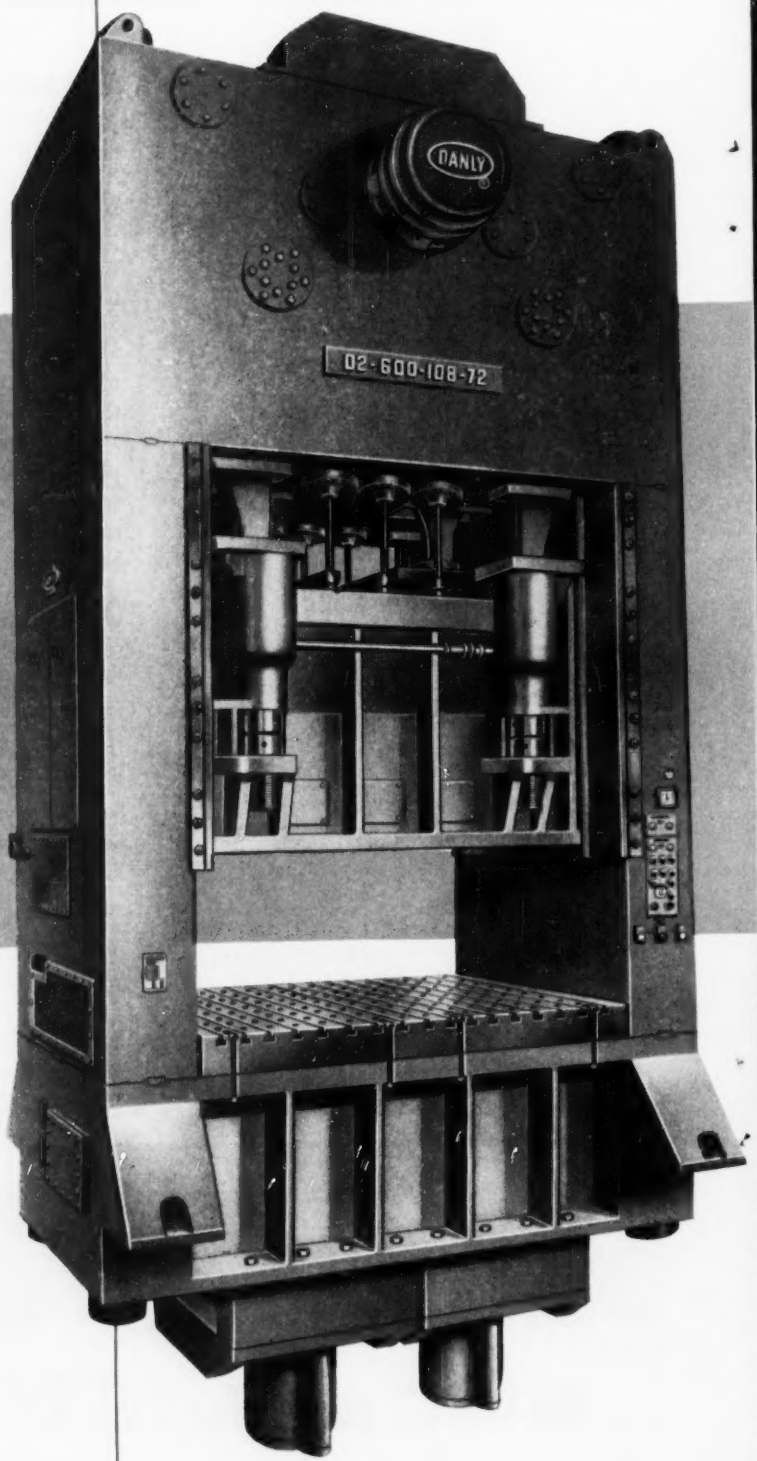


RUNDUM

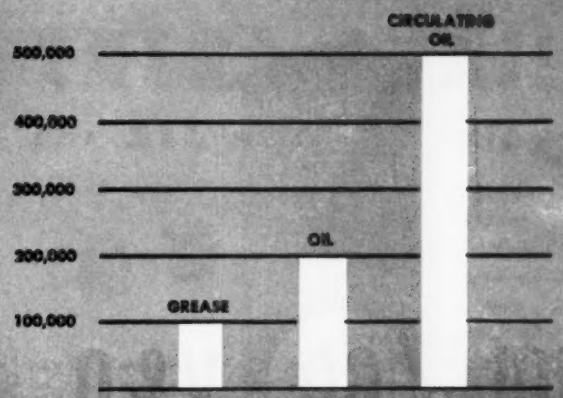
. . . the ONLY source for EVERY abrasive product you need

check your maintenance records!

DANLY



SAFEGUARDED BY AUTOMATIC OIL LUBRICATION
View of 600-ton Danly Double Action Press featuring automatic oil lubrication to all wear points. Pressure system permits automatic safeguards against lubrication failure.



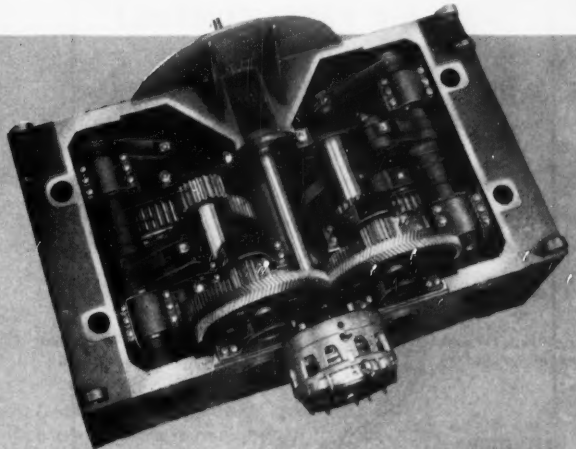
CIRCULATING OIL GIVES GREATER PROTECTION

Chart showing superiority of circulating oil lubrication for anti-friction bearings. Values at left represent bore of bearing in millimeters multiplied by speed in rpm . . . an accepted method for expressing limits of efficient bearing operation.

PRESSES

Actual day by day maintenance records in some of the country's biggest plants prove the importance of bearings in over-all press maintenance cost. The same records prove the cost advantages of Danly's automatic *circulating oil* lubrication system. Bearings wear longer because they run cooler and cleaner, continuously supplied with the proper amount of filtered oil lubrication.

Routine maintenance is reduced because periodic oiling or greasing is eliminated. The hazard of lubrication failure due to neglect or breakdown is eliminated by automatic safeguards. For the best in presses, come to DANLY.



CIRCULATING OIL TO ALL ANTI-FRICTION BEARINGS

Danly first and second intermediate shaft and drive shaft bearings, indicated in color in this exposed crown view are all anti-friction type, lubricated by filtered circulating oil. Cooler, cleaner operation prolongs life.

DANLY®

MECHANICAL PRESSES . . . 50 to 3000 TONS
HYDRAULIC METALWORKING EQUIPMENT



For complete details on outstanding Danly Press features . . . construction, drive, lubrication or operation . . . send for the Double Action Press Catalog today! Danly engineers are at your service.

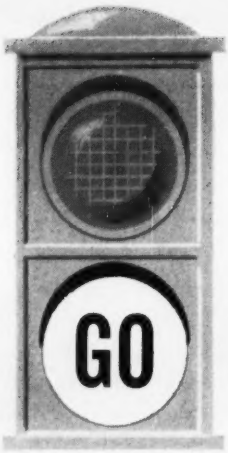
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

It costs less to run a DANLY PRESS!

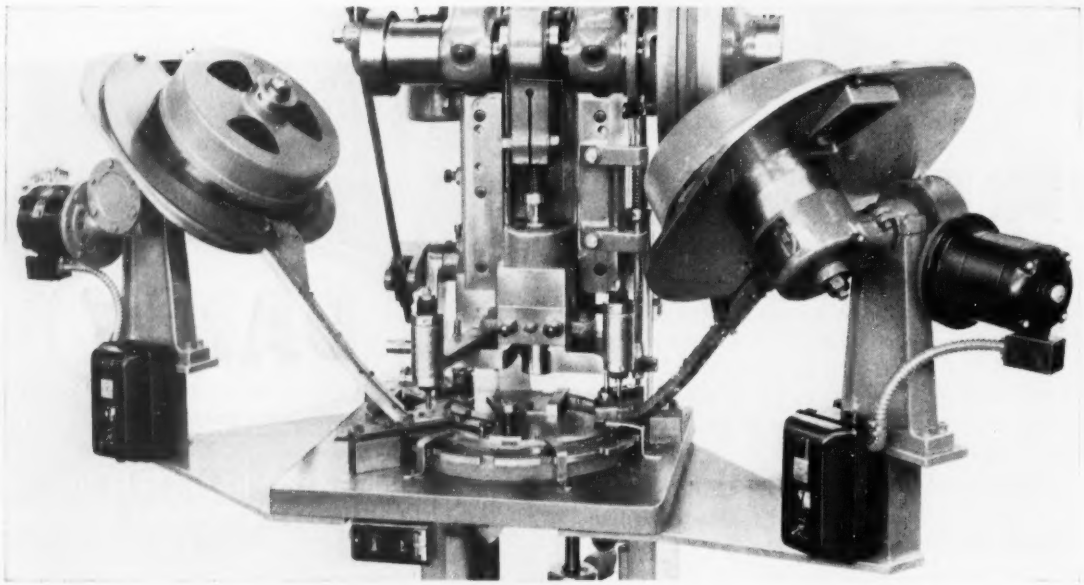


Single Action Straight Side | Autofeed | Underdrive Single, Double Triple Action | Gap Frame | Double Action Straight Side

When you run V & O long slide presses you can inspect an occasional few of your stampings and be sure that the others are exactly like them. And when you can do that, when your machines operate with such consistent precision that random or chance imprecisions are statistically unlikely, then you have quality control.



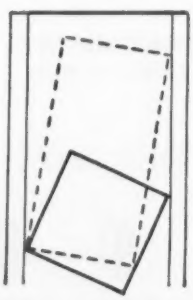
FOR QUALITY CONTROL GO V&O



V & O long slide press that automatically feeds and assembles two parts from their individual hoppers, 128 strokes a minute.

INVITATION TO INGENUITY

V & O long slide design provides space for precision-promoting tooling. Ingenious design can apply moving and stationary members that make random operating imprecisions statistically unlikely.



THE LONG SLIDE PRINCIPLE

eliminates the random imprecisions that can come from stroke misalignments.

The longer the slide the less can be the angular misalignment.

THE V & O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

Only the best is good enough

(For more information on products advertised, use Inquiry Card page 245)

EXTRA AUXILIARY CONTACTS

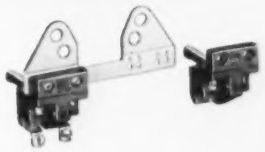
for ALL Allen-Bradley Starters . . . Sizes 0 to 7



Auxiliary Contacts—Sizes 0 & 1

NOW . . . it's easy to add auxiliary contacts to A-B solenoid starters to operate extra relays, pilot lights, or other accessories. Just follow the steps shown below.

Bulletin 895 auxiliary contacts come in forms to fit all sizes of starters . . . with either single pole normally open, normally closed, or normally open-normally closed contacts. They can be added to any A-B starter in stock or in service.



Auxiliary Contacts—Sizes 2 & 3

ADD ONE OR TWO AUXILIARY CONTACTS TO ANY A-B SOLENOID STARTER



Bulletin 709 Size 0 starter with auxiliary lock-in contact

Bulletin 709 Size 0 starter with one extra auxiliary contact

Bulletin 709 Size 0 starter with two extra auxiliary contacts

SIZE 0 STARTER

One or two extra auxiliary contacts can be mounted on Size 0 arc hood. Terminals are easily accessible from front. Rugged—simple—trouble free.



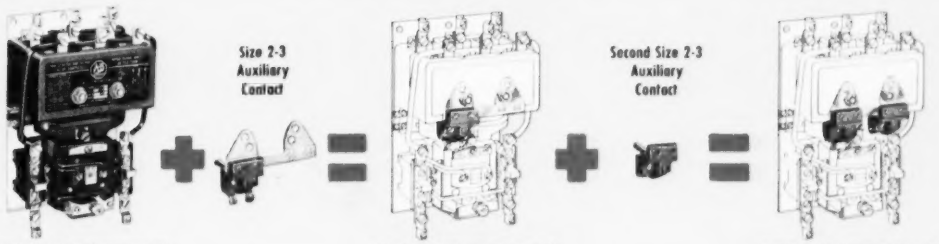
Bulletin 709 Size 1 starter with auxiliary lock-in contact

Bulletin 709 Size 1 starter with one extra auxiliary contact

Bulletin 709 Size 1 starter with two extra auxiliary contacts

SIZE 1 STARTER

One or two extra auxiliary contacts can be mounted on Size 1 arc hood. Terminals are accessible from front. Existing wiring not disturbed in any way.



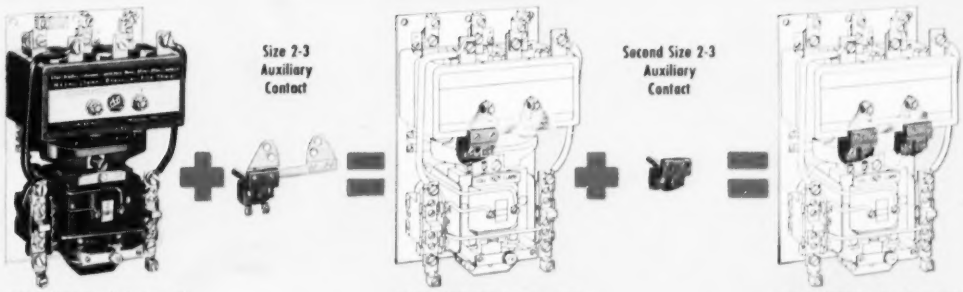
Bulletin 709 Size 2 starter with auxiliary lock-in contact

Bulletin 709 Size 2 starter with one extra auxiliary contact

Bulletin 709 Size 2 starter with two extra auxiliary contacts

SIZE 2 STARTER

Mounting plate will hold one or two extra Size 2-3 auxiliary contacts. It is attached to starter using existing arc hood threaded studs and lock nuts. Solenoid plunger of starter actuates the auxiliary contacts.



Bulletin 709 Size 3 starter with auxiliary lock-in contact

Bulletin 709 Size 3 starter with one extra auxiliary contact

Bulletin 709 Size 3 starter with two extra auxiliary contacts

SIZE 3 STARTER

The Size 2-3 mounting plate will also fit the Size 3 arc hood and support one or two auxiliary contacts. Easy to install and simple to operate. Trouble free performance is guaranteed. No contact maintenance.

Contact arrangements are readily changed from normally open to normally closed, or vice versa. This flexibility opens new possibilities for applying Allen-Bradley contactors and starters to automatically controlled equipment.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY

MOTOR CONTROL

8-53-MR

MAKE YOUR OWN TERMINAL STRIPS

with these handy

BULLETIN 892 TERMINAL BLOCKS

EASILY MADE UP IN ANY LENGTH TO MEET YOUR TERMINAL STRIP SPECIFICATIONS

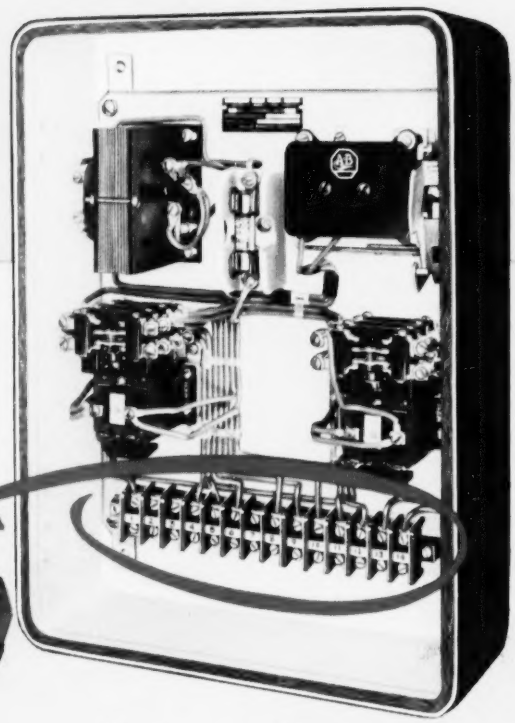
Bulletin 892 terminal blocks interlock in perfect alignment to provide the exact number of terminals for any panel board. There are no excess terminals—hence, no waste of panel space. The required terminal strip can be assembled quickly and mounted on the panel with hold-down bolts. Plastic barriers separate the clamp-type terminals which have lock washers.

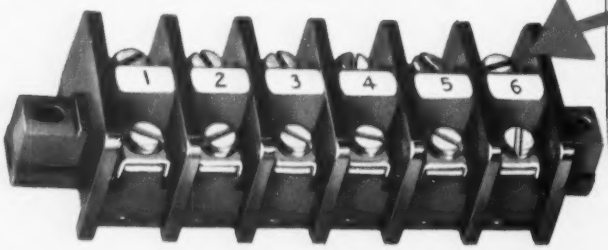
One end block and any number of terminal blocks may be hooked together. In general, every 13th block is used to secure a long terminal strip to the panel.

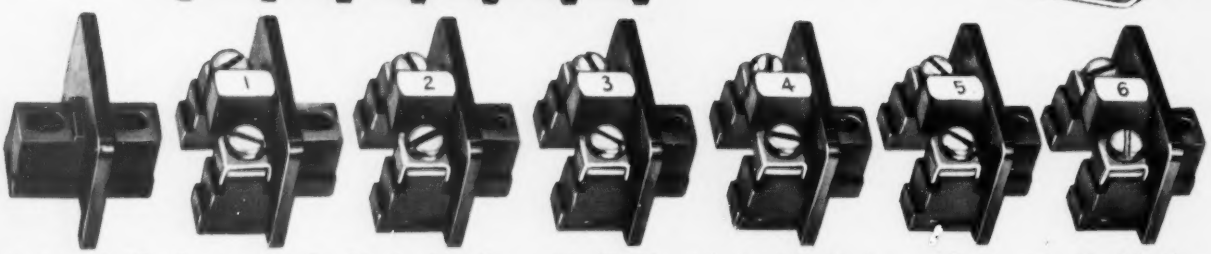
AVAILABLE IN TWO CURRENT RATINGS
15 AMPERES—25 AMPERES

Dimensions of Bulletin 892 Terminal Blocks

Ampere Rating	Width	Height	Over-all Length of 10 Blocks
15	1½"	1"	7"
25	1⅞"	1⅛"	8⅛"







INTERLOCKING TERMINAL BLOCKS

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

8-53-MR

Pressure Processing

. . . whoever uses it in their production is a customer or potential customer of **H-P-M**



DRAW . . . TRIM . . . PIERCE . . . and FLANGE in ONE OPERATION on this H-P-M!

That's the way Dura Steel Products Co., Los Angeles, handles the high-speed production of medicine cabinet bodies on their versatile 300-ton All-Hydraulic H-P-M, equipped with a two die set-up. One die draws the 16" x 26" cabinet body to a depth of 4-1/8" while the other die simultaneously handles the flange, pierce and trim operations. The press shows great versatility in handling many of the intricate jobs which are accepted from government agencies and other manufacturers.

No matter how simple or complex your pressure processing job may be . . . it's a good idea to plan it with the help of an H-P-M engineer.

HPM THE HYDRAULIC PRESS MFG. CO.

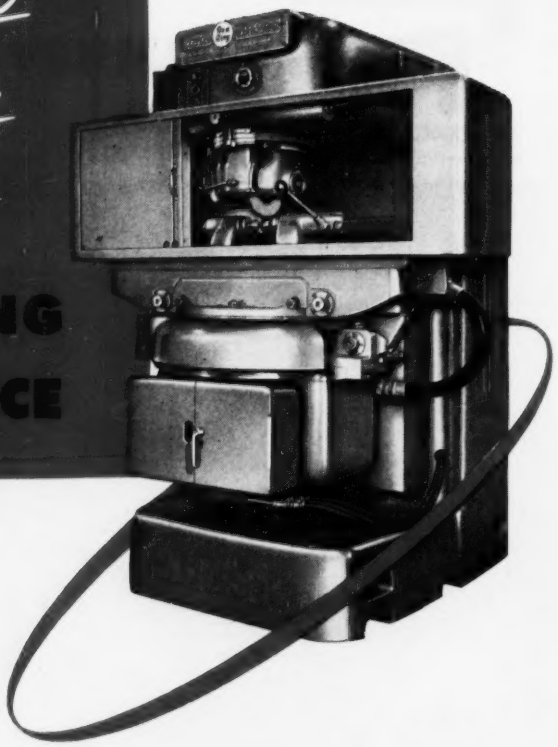
1042 Marion Road, Mount Gilead, Ohio, U. S. A.

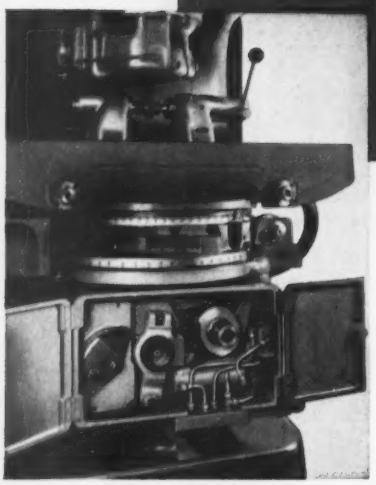
Presses for Every Pressure Processing Application

(For more information on products advertised, use Inquiry Card page 245)

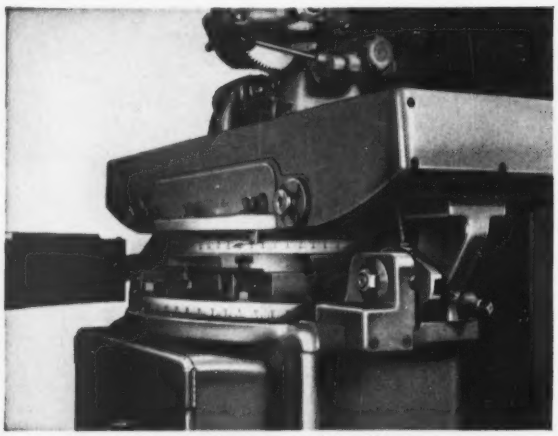
An Important Contribution

To GEAR SHAVING PRACTICE





Differential up-feed mechanism



Crowning cam and bracket

Two new features are now optionally available with the Red Ring Gear Shaving Machine Model GCU — Automatic Differential Up-feed and Conventional Crowning. So equipped, any of the recognized processes in the field of rotary gear shaving may be performed on this machine. It thus becomes economically applicable to both high production and to job shop operations and to gears of all characteristics within its size range.

Specifically the Model GCU with these additions can be used for:

(1) Diagonal shaving at fixed center distance on a two stroke cycle.
(2) Diagonal shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
(3) Conventional shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
(4) Precision gear crowning accomplished by rocking the table during any conventional shaving cycle.
(5) Taper shaving to specification.

Automatic cycling is precise and very fast. Production rates are high and cutter life has been increased to as much as 200%.

Write for Bulletin S53-7 which gives all the details of this important new development.

6501



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

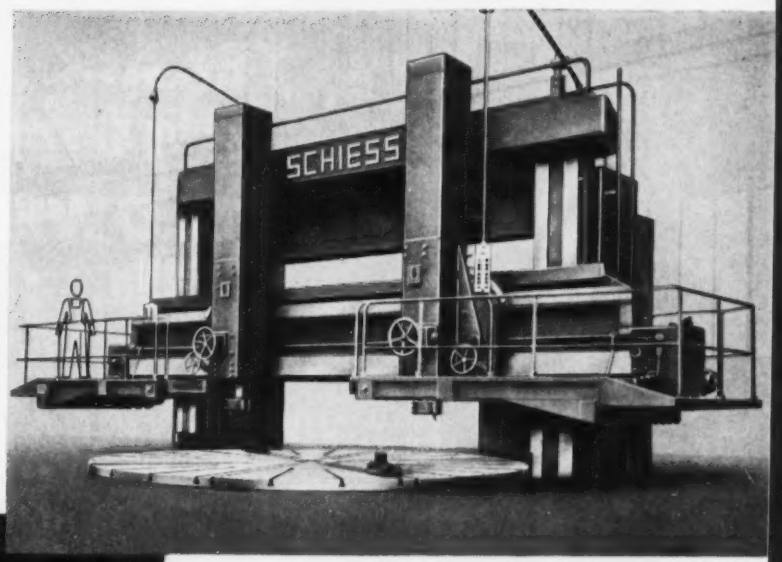
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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See SCHIESS equipment on display at
AMERICAN SCHIESS SERVICE CENTER
38th Street & AVRR • Pittsburgh, Pa.

By combining basic Schiess elements, extra heavy machines that would normally be considered special tools, can be built to your work diameter and load requirements.

The equipment shown here is typical of unusually large boring mills of latest Schiess design which, like the smaller models, incorporate new operating features listed below.



Model 3K Vertical Boring Mill
with 15 ft. turning diameter

NEWLY DESIGNED

HUGE VERTICAL BORING & TURNING MILLS *like these* -

Built from basic Schiess designs to any diameter from 10 ft. to 84 ft.

Model 5K Vertical Boring Mill
with 22 ft. turning diameter



Fingertip Speed Control

Counterbalanced cross rail and side head

Octagon rams which can be swiveled, completely enclosed

Pendant Control

Automatic Lubrication

Vertical Boring Mills of this type can be equipped with inner and outer tables—and with 1 or 2 operator control panels.

Engineering Division

AMERICAN
SCHIESS
CORPORATION
38th Street and AVRR, Pittsburgh, Pennsylvania

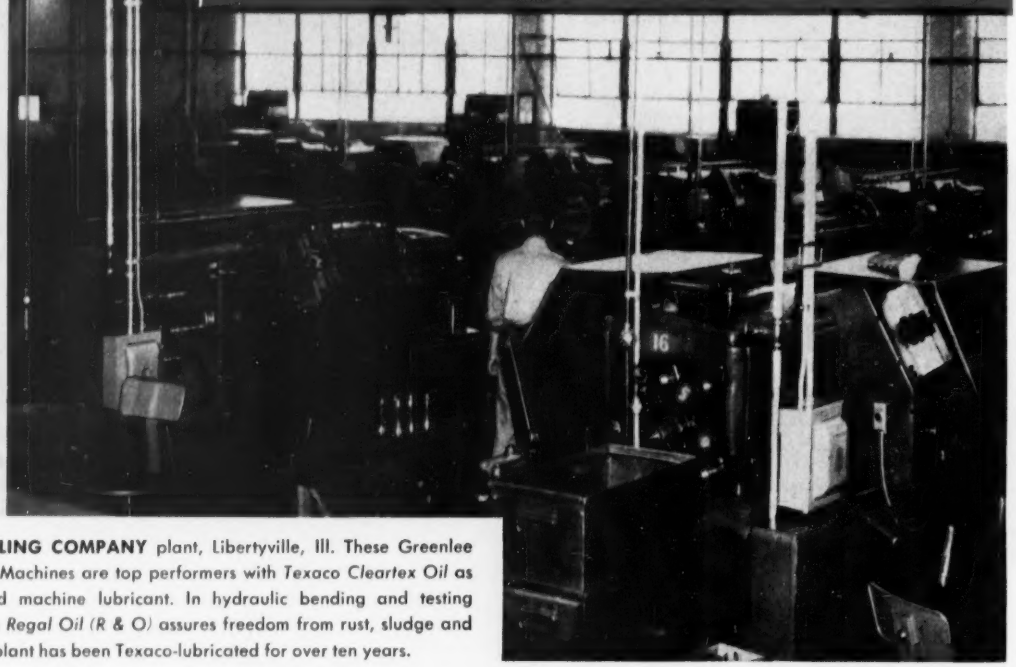
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KO KURT ORBAN COMPANY, INC.
205 East 42nd St., New York 17 • 1256 East 12th St., Cleveland 14
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"FOR OVER 10 YEARS, TEXACO HAS HELPED US TURN OUT MORE AT LOWER UNIT COST—"

Edward J. Demlow, Superintendent, Anchor Coupling Company, Libertyville, Illinois



ANCHOR COUPLING COMPANY plant, Libertyville, Ill. These Greenlee Automatic Screw Machines are top performers with *Texaco Cleartex Oil* as both coolant and machine lubricant. In hydraulic bending and testing machines, *Texaco Regal Oil (R & O)* assures freedom from rust, sludge and foam. The entire plant has been Texaco-lubricated for over ten years.

ANCHOR COUPLING COMPANY specializes in the manufacture of hydraulic hose with special couplings. Steel, brass and aluminum are machined on various machines, including a battery of 13 Greenlee automatics. Texaco Cutting Coolants and Hydraulic Oils have been used exclusively for over ten years, with outstanding results:

"We get top-speed production with Texaco, and the finish of parts coming through is excellent. Tool life has been exceptional. In addition, the help rendered by Texaco Lubrication Engineering Service has been an invaluable asset to us."

And so it is in every type of plant, wherever located. *Texaco Cutting, Grinding and Soluble Oils* and other Texaco Industrial Lubricants—used in conjunction with Texaco Lubrication Engineering Service—are helping manufacturers produce more at a lower unit cost.

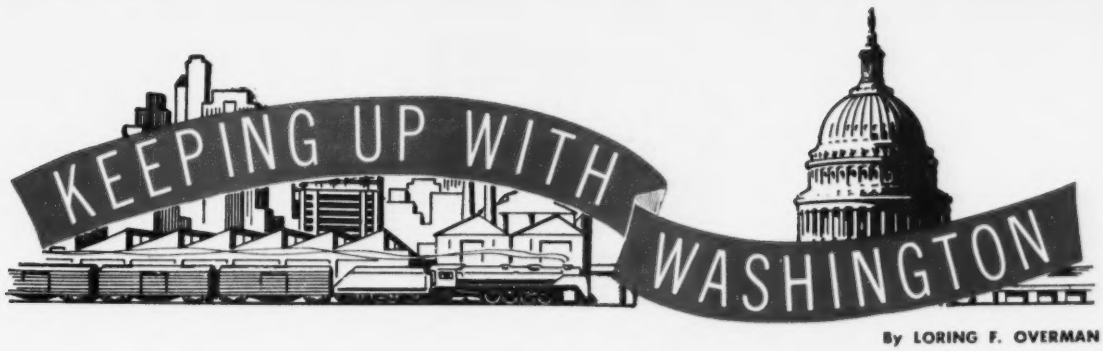
Let a Texaco Lubrication Engineer help you gain these important benefits. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO Lubricants, Fuels and Lubrication Engineering Service

(For more information on products advertised, use Inquiry Card page 245)



By LORING F. OVERMAN

Washington Seers Hard to Convince

WASHINGTON gives the impression, these days, of a person pinching himself to make sure that he is awake. Week after week many people have been expecting a recession, and instead they find production and employment at an all-time high, sales up, credit in demand, and month-end statements showing that the economy is holding its own or fluctuating insignificantly.

In other words, Washington forecasters feel that they had better play it safe and concede the possibility of a recession—yet the results to date belie their fears.

H-Bomb Reactions

The chain reaction set up over the steppes by Russia's H-bomb has had its counterpart in this country. Coming right at the time when cruelties to UN prisoners were being revealed, the H-bomb news helped to strengthen this country's decision to keep up its guard and to take no chances. Thus, with Korean ammunition cutbacks ordered, the talk is of improving defenses. And with Korea no longer demanding munitions, money has become available for rebuilding the battlefield peninsula. To build up Korea, rather than to blow it up, will also cost millions.

THE H-bomb news may be expected to foster the decentralization of industrial facilities in this country. Whenever a new defense plant costing more than a million dollars is authorized, its location may be expected to be ten or twenty miles from congested business centers. Four out of five such plants built during the last two years have been so dispersed—but for reasons which can be considered economical rather than thermonuclear.

The recent General Motors fire at Livonia, Mich., has caused industrial planners to put on their thinking caps. Because of that conflagration the automobile industry may turn out 300,000 fewer cars than was anticipated this year, at a loss of $750,000,000 in sales. Military men are reading into that fire an object lesson on the importance of dispersing and diversifying sources of supply for military items.

Stand-by System Again

Although there are many differences of opinion as to how to handle military production, there is general agreement that some provision should be made to have stand-by plants ready to jump into production at a moment's notice. There have been several suggested plans, most of which visualize all-out idleness of the equipment during the nation's peacetime periods.

The newest plan—and one that is currently meeting with favor—was proposed by the Army Ordnance Corps. When the present defense program tapers off, Ordnance will have a large number of production machines under its jurisdiction. After the last war the same condition existed, but there was no plan for handling the machines. This time, Ordnance hopes to be ahead of the game. To industries making products for which Ordnance believes stand-by facilities should be provided, the following ideas are suggested:

1. The contractor may be asked to retain the machinery on lease, keeping it in good condition and using it for civilian production.
2. The producer may let the tools stand idle, charging the Government rental for the space occupied.
3. The contractor may dismantle the machines, store them on the premises, and collect storage fees.
4. As a final alternative, Ordnance may pick up the machines and store them on its own property. The drawback here is that in case of another emergency, months may be required to get machines back in production.

As a starter toward both the lease and moth ball ideas, Ordnance has already placed $36,500,000 worth of machine tools in plant storage or on lease for use in commercial work.

ANOTHER idea on how to handle the machine tool "problem" has been advanced by the General Services Administration. The suggestion is that older machine tools in the government stockpile be bartered off to foreign countries in exchange for critical materials needed for the nation's stockpile. Under the barter plan, the machines would not be dumped on the American market or given away.

What Happened to Former Functions of the Munitions Board

Twenty-one functions formerly vested in the discontinued Munitions Board have been assigned to Charles S. Thomas, Assistant Secretary of Defense for Supply and Logistics. The authority is outlined in the first of six charters which Defense Secretary Wilson will direct to his assistant secretaries. While making policy on procurement for the Armed Services, Mr. Thomas will have no authority to negotiate contracts.

Item No. 16 of the twenty-one-point directive reads: "Formulating policies and programs of the Department of Defense in relation to industrial or commercial type facilities and production equipment, and administering the responsibilities of the Secretary of Defense in relation to machine tool and production equipment reserves provided for in the National Industrial Reserve Act of 1948 (P.L. 883, 80th Congress)."

Item No. 18 authorizes: "Prescribing a single supply catalogue system and accomplishing its progressive utilization in all supply functions with the Department of Defense, including the administration of the Defense Cataloguing and Standardization Act (P.L. 438, 82nd Congress)."

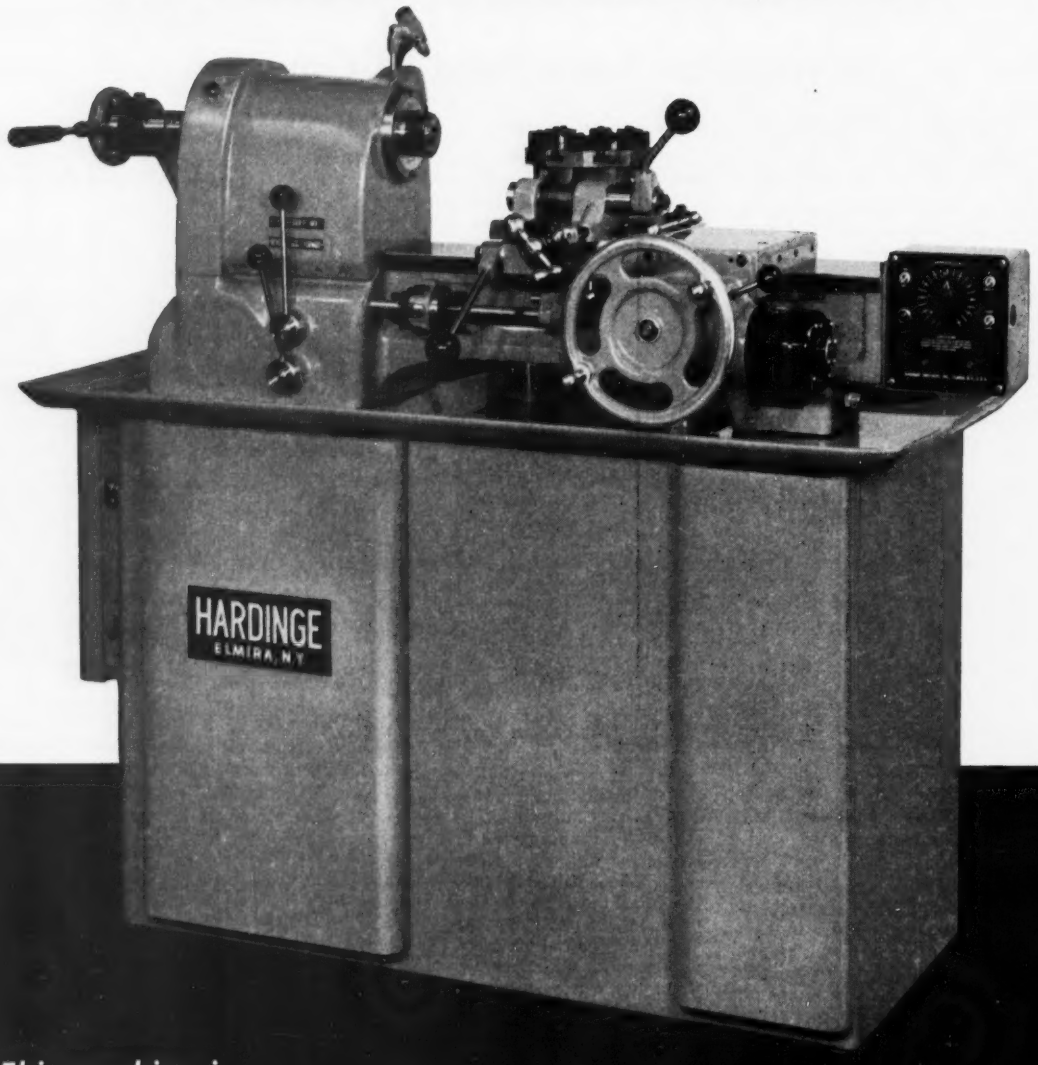
Tax Opportunity

Besides remaining on the alert for important changes in requirements and in procurement procedures, industry-management should take time to scan proposed changes in Federal tax legislation. The House Ways and Means Committee has promised a complete overhaul of the present tax structure. The changes are to be patterned after suggestions received during weeks of public hearings and by mail during the recess. The tax writers expect to have their suggestions in the hopper soon after Congress convenes in January.

If members of Congress are aware of their constituents' wishes, action on the revisions could be fast. Otherwise, the legislation might drag on for months.

HARDINGE
ELMIRA, N.Y.

HIGH SPEED CHUCKING MACHINE



This machine is an Essential for lowering Manufacturing Costs

Write for Bulletin HC

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

OFFICES IN PRINCIPAL CITIES. EXPORT OFFICE: 269 LAFAYETTE ST., NEW YORK 12, N. Y.

(For more information on products advertised, use Inquiry Card page 245)

Signposts for Continued Prosperity

INTELLIGENT efforts are being extended by the Eisenhower Administration toward maintaining sound economic conditions. One of the latest moves has been to enlist the aid of economic experts at key points around the country who will send monthly reports to the White House that will outline economic trends in each particular locality.

Bankers, businessmen, labor leaders, and politicians, wise in the affairs of their communities, will serve as "listening posts." They will report direct to W. Walter Williams, Under Secretary of Commerce, who was recently assigned to an office in the White House. The Under Secretary and economic advisers will evaluate the information and, presumably, formulate plans to counteract any deleterious symptoms.

Industrial leaders can be of inestimable help in the success of this program by extending wholehearted cooperation and supplying true facts as early as possible. Through their sales representatives, business concerns keep a sensitive finger on the nation's buying pulse and are among the first to sense prosperity booms and detect economic depressions. By supplying sales information to the experts who are attempting to smooth out the economic hills and valleys, businessmen will be working in the best interests of their employes and stockholders.

Under Secretary Williams could well avail himself of the facilities of the business press in setting up his network of economic contacts. Business papers could render useful service, both because of their intimate contacts in specialized fields and because they constitute an information source that is not affected by political considerations. Business paper editors are themselves an up-to-the-minute source of information. Apart from that, they can be highly useful in suggesting people who will be best qualified to serve as dependable spokesmen for the different branches of industry.

The first plans of the new economic group should be to foster productivity by making it easier for manufacturers to replace slow and worn out machines with modern equipment. Productivity is, after all, one of the most important keys to national prosperity because the more goods that are available at moderate cost, the greater the demands for the products of the farm and factory and the greater the number of employed.

Many plants were not able in recent years to buy new machines that would have increased their productive efficiency, due to abnormal conditions in the machinery building industries created by the Korean War. Buying is now being held back because of archaic and restrictive tax laws which control depreciation allowances on productive equipment.

The Treasury Department has been considering more favorable depreciation rates. Perhaps the new economic group can persuade officials to make an early decision in that direction. However, even if this is accomplished, much will have to be done to bring about widespread acceptance of a sound replacement policy.

Any program that will increase productivity will benefit the nation as a whole.

Charles O. Herb

EDITOR



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MACHINERY

Vol. 60 OCTOBER, 1953 No. 2

Automatic Arc Welding

Aids Assembly of Diesel Engine Parts

by

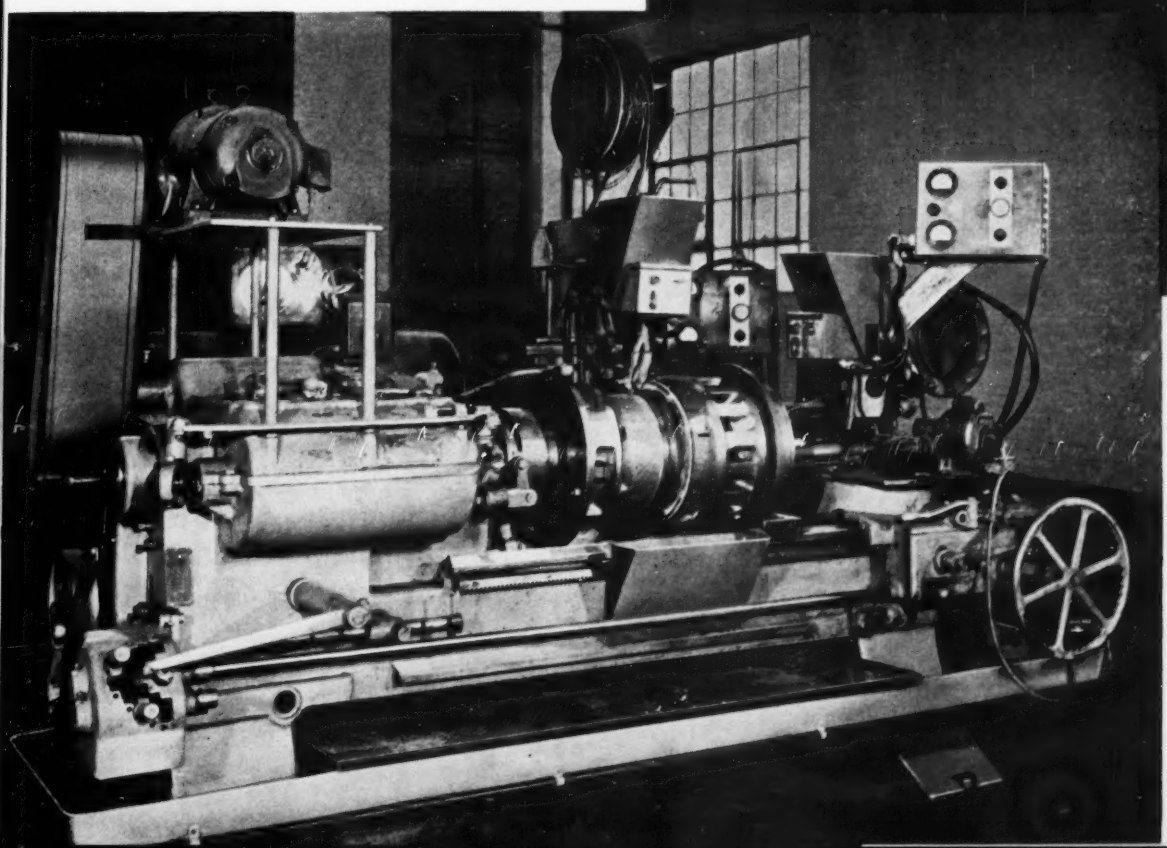
Herbert Chase

SOME models of engines manufactured by the Cleveland Diesel Engine Division of General Motors Corporation, are so constructed that cast-steel cylinder liners must be arc-welded to cast-steel cylinder heads. These welds are made from both the inside and outside of the cylinder. Two steel jackets are later welded to the head-cylinder assembly.

To insure welds that are sound and to make them rapidly and precisely, automatic arc-welding machines designed especially for the purpose are employed. All of these machines make one or more external girth welds. Also, one machine produces a circumferential internal weld that is unusual on cylinders of comparatively small diameter, especially where the weld is close to a blind end and deep inside the cylinder, as in this instance.

All of these welds are of the submerged- or hidden-arc type, employing granular flux which is fed automatically. Such welds not only afford high penetration but are of uniform quality. The welding speed is much faster than for hand arc welding.

In the machine shown in the illustration, the cylinder head is arc-welded to the end



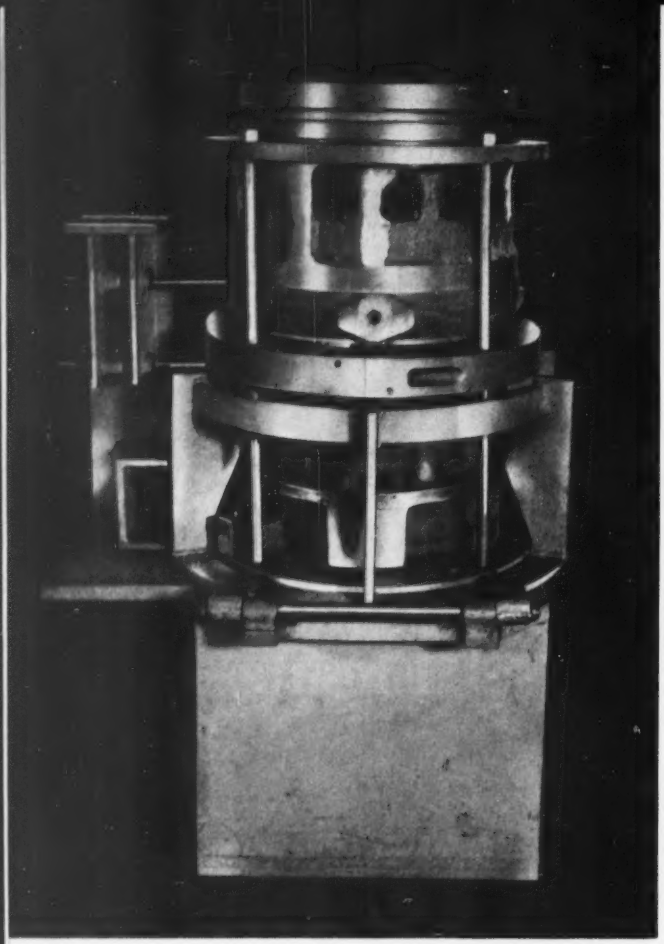


Fig. 1. Special fixture that clamps a cylinder head and a cylinder in correct relative position to be joined by arc welding.

of the cylinder. This machine is a converted turret lathe that was modified to include two automatic Lincolnweld heads and a special drive so that the work-piece could be rotated at a slow speed suited to the welding to be done. The fixture, Fig. 1, holds the two parts to be joined. For internal welding, it is supported by the headstock at one end and by rollers at the open end, as seen in Fig. 2. In this way, the bore of the liner is accessible, and the electrode wire and flux can be brought to the internal weld.

It is essential that the cylinder head and cylinder be held in precisely correct relative position so that the annular boss on the under side of the head will form a true continuation of the liner when the two are joined by welding. This alignment is insured by placing the fixture on a stand, as shown in Fig. 1, while the two components to be joined are set in place. After the fixture rings have been added, the work is clamped by longitudinal bolts. Then the loaded fixture is transferred by a trolley hoist to the welding machine and placed so as to be driven by the headstock spindle. In the heading illustration and Fig 2, only part of the fixture appears, these illustrations showing the set-up after the internal weld has been made but before external welding is performed.

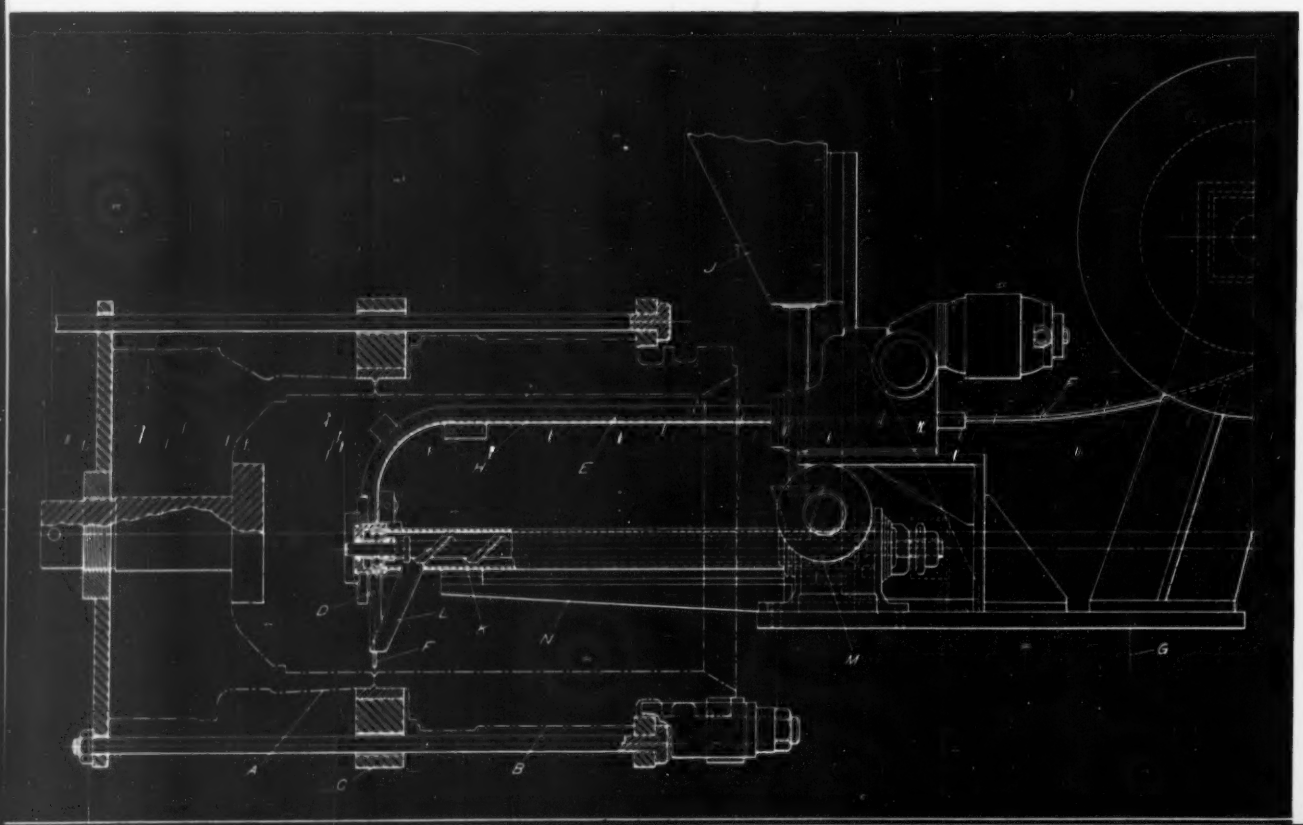
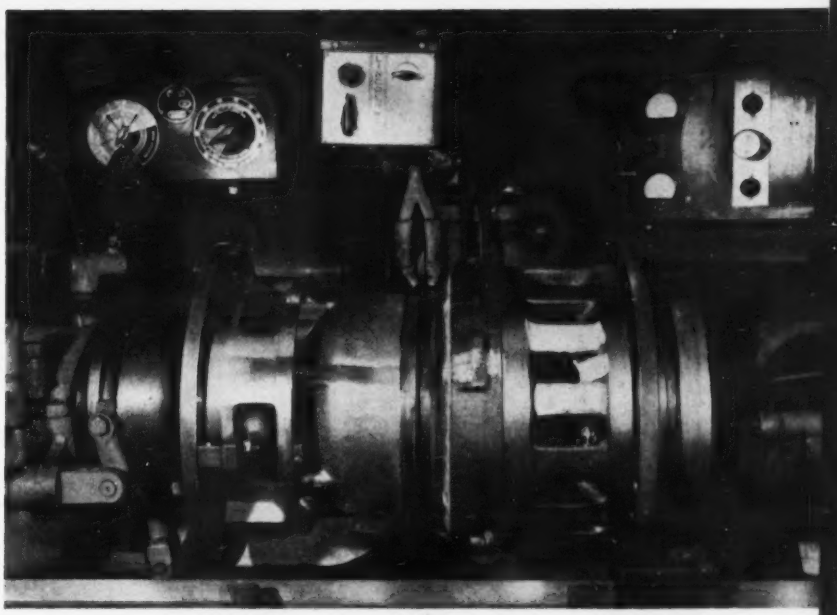


Fig. 2. Close-up view of the cylinder-head assembly as it appears after the internal weld has been made and part of the fixture removed to permit external welding.



In the drawing of the welding fixture, Fig. 3, the broken lines show the cylinder head *A* and cylinder *B* in correct location for welding. Also shown are portions of the fixture and of the modified head that makes the internal weld. Each of the components to be joined is beveled both internally and externally to provide V-grooves in which the two weld beads are laid down. As the internal weld is made first, a split steel-backed copper ring *C* is applied outside the joint. This ring not only helps to hold the weldment components in true alignment but effectively prevents any chance of burn-through from the internal weld.

Since no conventional hidden-arc welding head is small enough to enter the cylinder to make the internal weld, it was necessary to modify a standard head *D* by adding an extension *E* that brings both the electrode *F* and the flux to the joint to be welded. Other portions

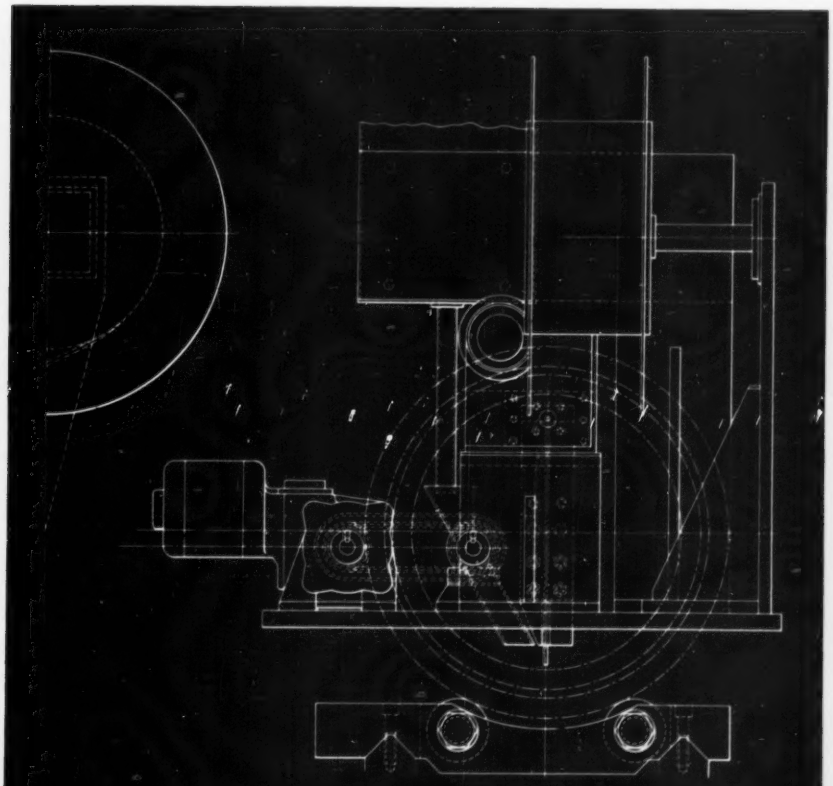


Fig. 3. Drawing of the set-up for making the internal weld that joins the cylinder head (A) and cylinder (B). A screw conveyor (K) feeds the flux

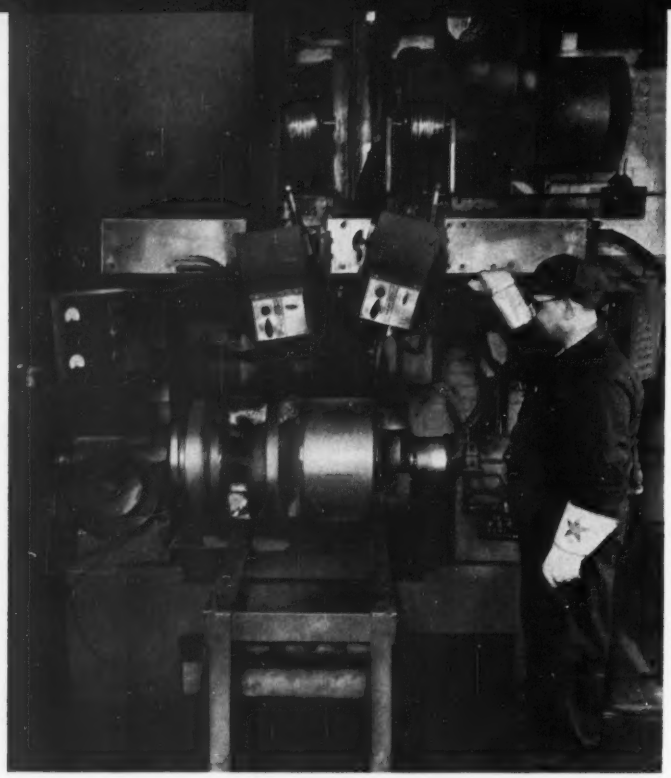


Fig. 4. Machine employed for producing two automatic, hidden-arc girth welds that join the wider of two jacket rings to the cylinder-head assembly.

of the welding head are mounted outside the fixture, and the head is supported on the turret carriage *G* of the converted lathe. In this way, the head and its extension are easily brought into welding position after the loaded fixture is in place. For the internal weld, L-60 mild steel electrode wire *F* of 1/8-inch diameter is advanced by the standard feeding device. The electrode wire reaches the weld area through a tube *H* that makes a 90-degree sweep bend to bring the end of the electrode at right angles to the axis of the sleeve.

Flux feeds from the external hopper *J* in the usual way, but instead of going directly from the hopper to the weld is advanced horizontally about 20 inches by a small screw conveyor *K*. This conveyor delivers the flux to a short spout *L* that terminates just above the weld area. A special motor drive *M* is provided for this conveyor and so controlled that the conveyor runs only when flux feed is needed. Both the conveyor and the electrode tube are supported by a bracket *N* which extends from the lathe turret into the cylinder.

With this set-up the internal weld is made as the fixture and work rotate slowly. In effect, the arrangement is the same as that for any internal circumferential weld, but includes extensions of a standard head because the latter is too large to enter the sleeve.

Although the internal weld is made so far inside the cylinder that the progress of welding is not easily seen by the operator, the weld produced is a good one. In either case the arc is covered by the flux, much of which, in this instance, remains inside the sleeve until the weldment is removed. When the internal weld is completed, the welding head and its extension are withdrawn by retracting the turret carriage, and parts of the fixture, including the split copper ring, are taken off. The weldment, however, remains supported while the external weld is made.

For the external weld, a separate standard head (seen in the heading illustration and Fig. 2) is employed. This head is located directly above the cylinder, and merely has to be lowered to welding position after the head for internal welding is retracted. External welding is done much the same as internal welding, except that no head extension is needed, and at practically the same speed—10 inches a minute. This external bead is laid down in the V-groove provided for it. Unfused flux is screened and collected, and a vacuum pick-up is provided to return the flux to the feed hoppers.

Cylinders for these diesel engines are S A E 1020 steel castings, having a row of inlet and exhaust ports cut through the cylinder wall about midway along their length. Because the outer wall of the water jacket cannot be extended across these ports, the jacket wall is made in two parts, one above and one below the ports. Thus, in effect, there are two jackets that are separate save for connecting holes drilled through separators between the ports.

Welding of the lower jacket to the cylinder-head assembly is performed in the Cecil C. Peck

machine shown in Fig. 4. The jacket, rolled from flat stock with its ends joined by a flash-welded seam, is placed over the cylinder-head assembly, after which the assembly is clamped in the machine. This brings the ends of the jacket against flanges, where girth welds are to be made. The welding machine is similar to a lathe, and has a bed, headstock, and tail-stock.

This set-up brings the joints directly below the two electrodes of two automatic heads, each of which has a hopper for feeding flux. The heads also have the usual arrangement for feeding L-60, 1/8-inch diameter wire which is drawn from reels above the heads. As soon as the set-up is ready for welding, the operator depresses a starting button. This starts the feeding of flux and wire, and the instant that the electrodes strike the arc the work starts to rotate. Welding proceeds until the joints are completed.

About three minutes is required to make one revolution, the speed of welding being 10 inches a minute. At the end of this revolution, the electrical current is shut off as the electrodes burn off; the flux and wire feed stop; and the workpiece, with the welds completed, comes to rest. Current for each weld is supplied by a 600-ampere, direct-current generator, parts of which appear in the background of Fig. 4. Unfused flux drops off onto a screen. Flux passing through the screen is recovered for re-use. A light air hammer is used to chip flux off the weld.

Welding of the upper water jacket, which is also rolled from flat stock and flash-welded before being applied, is accomplished in the Peck machine seen in Fig. 5. This machine is similar to the one shown in Fig. 4, and also includes two automatic heads for making two circumferential welds, one along each end of the jacket.

In this machine, however, both heads have to be inclined more because the jacket ring is narrower and the welds are closer together. Except for the welding heads, the machine is primarily a means of rotation, equipped with a headstock and tailstock between which the cylinder-head assembly is clamped by air.

Ends of the jacket are previously machined to mate with the flanges to which they are to be welded. A metal strap is applied to cover the holes drilled through port separators, in order to keep the flux out of the holes. Welding is performed as in the previous set-up, both of the girth welds being made simultaneously. The flux and wire employed are the same, and each head is served by its own 600-ampere, direct-current generator. Welding speed is at the rate of 10 inches a minute.

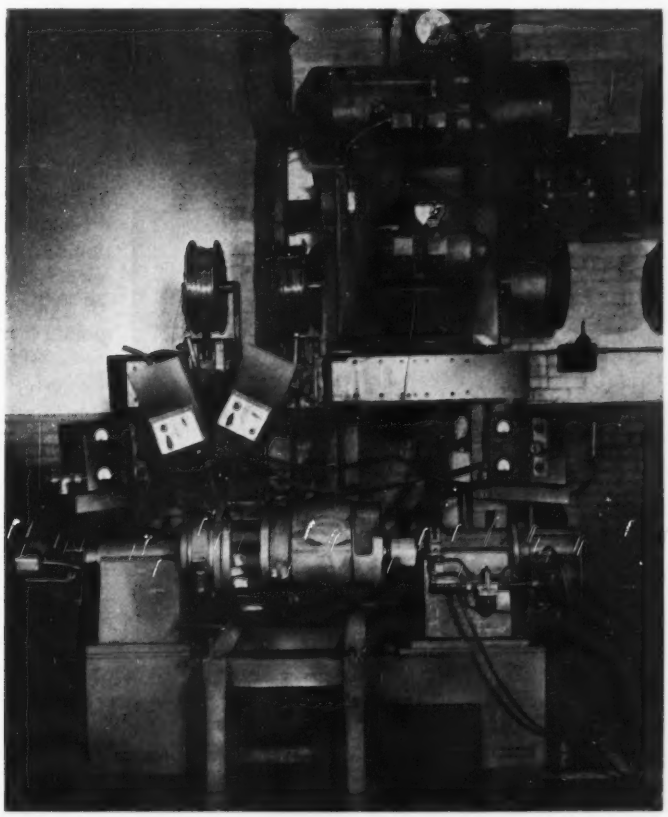
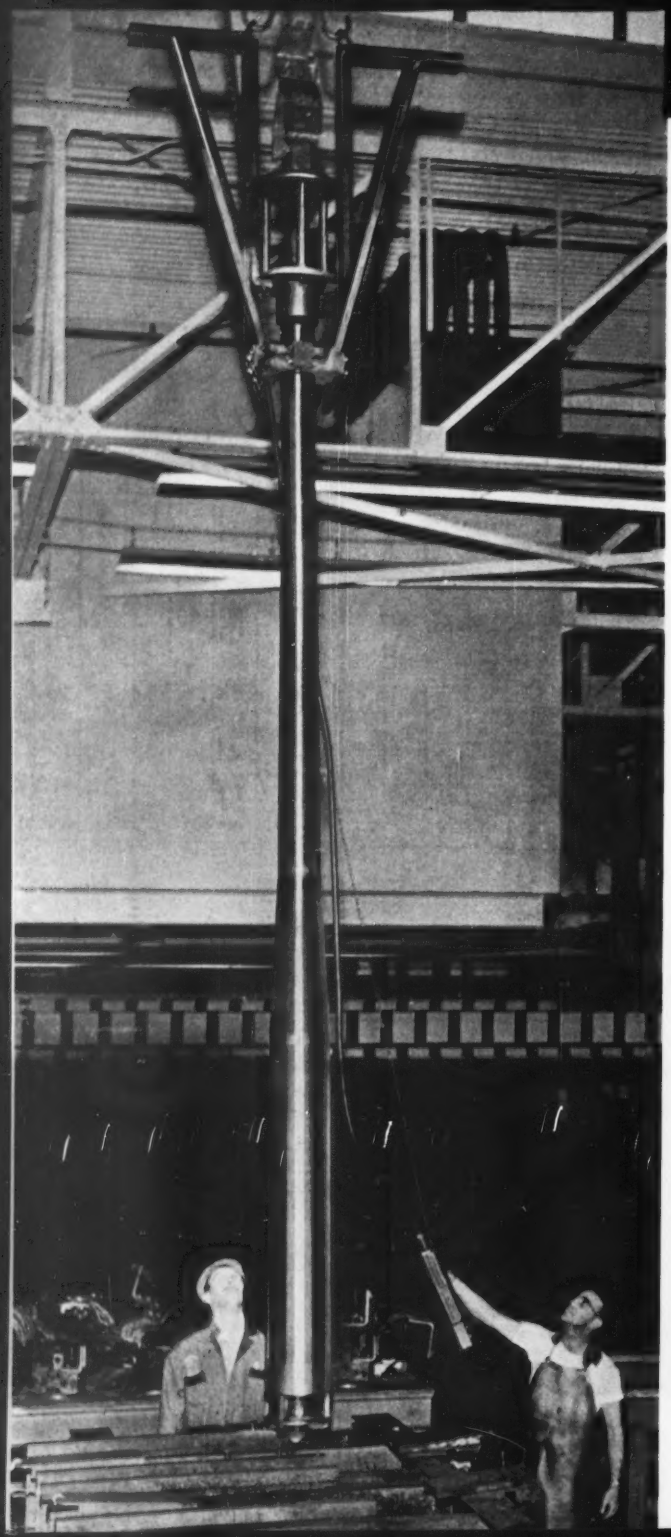


Fig. 5. Set-up that makes two, simultaneous hidden-arc welds which join the narrower jacket ring to the cylinder-head assembly.

Plating Gun Bores Gives Greater Accuracy and Longer Life



By C. E. McDowell, General Supervisor,
Chemical Engineering
Oldsmobile Division
General Motors Corporation
Lansing, Mich.

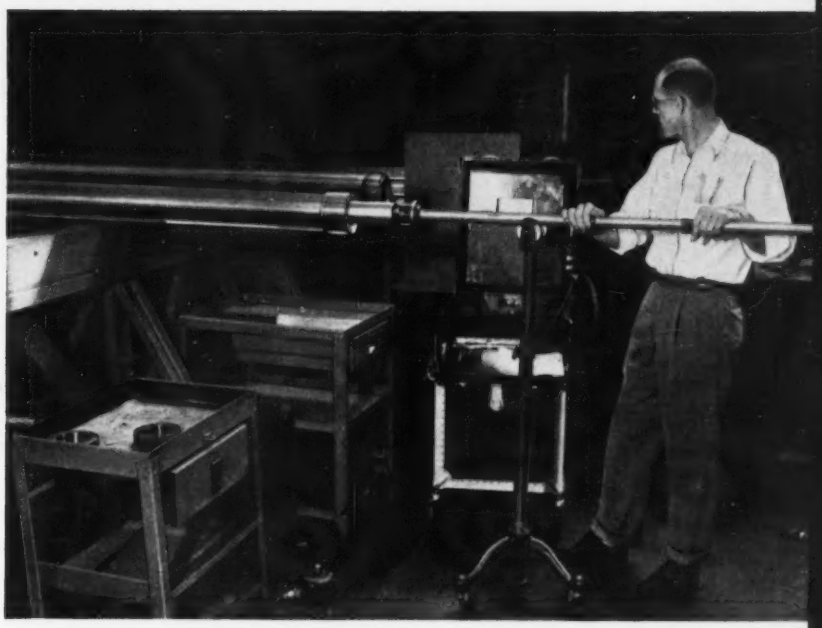
BY combining the know-how and ingenuity of Oldsmobile engineers with the technical and production experience of the Van Der Horst Corporation and Army Ordnance personnel at the Watervliet Arsenal, a successful production technique has been developed at the Oldsmobile Gun Plant in Lansing, Mich., for the hard chromium-plating of tube bores for 90-millimeter tank guns.

Smooth surface finishes and close dimensional tolerances are maintained inside the 15-foot gun tube, and the hard, wear-resistant coating provides improved and consistent accuracy, as well as longer gun life. In addition to being hard, electrodeposited chromium has a low coefficient of friction, good corrosion resistance, and high seizure resistance.

Heat-treated cast- or forged-alloy steel gun tubes are received at Oldsmobile from Government arsenals. After machining (including the broaching of rifling grooves), the tube bores are thoroughly inspected to determine possible flaws such as pits, or other conditions that might prevent satisfactory plating. This is accomplished with a Borescope—a long tube equipped with a light and mirror for visual inspection. An air-operated electronic gage, Fig. 1, is employed to accurately check the rifling inside the gun tube. Air pressure holds special contact balls against rifling, and any variations cause displacement of the balls, which is amplified electronically and revealed to the inspector.

The tubes are then cleaned by pushing rags saturated with oleum spirits through the bores.

Fig. 1. Air-operated electronic gage for accurately checking rifling inside gun tubes. Displacement of contact balls is amplified electronically.

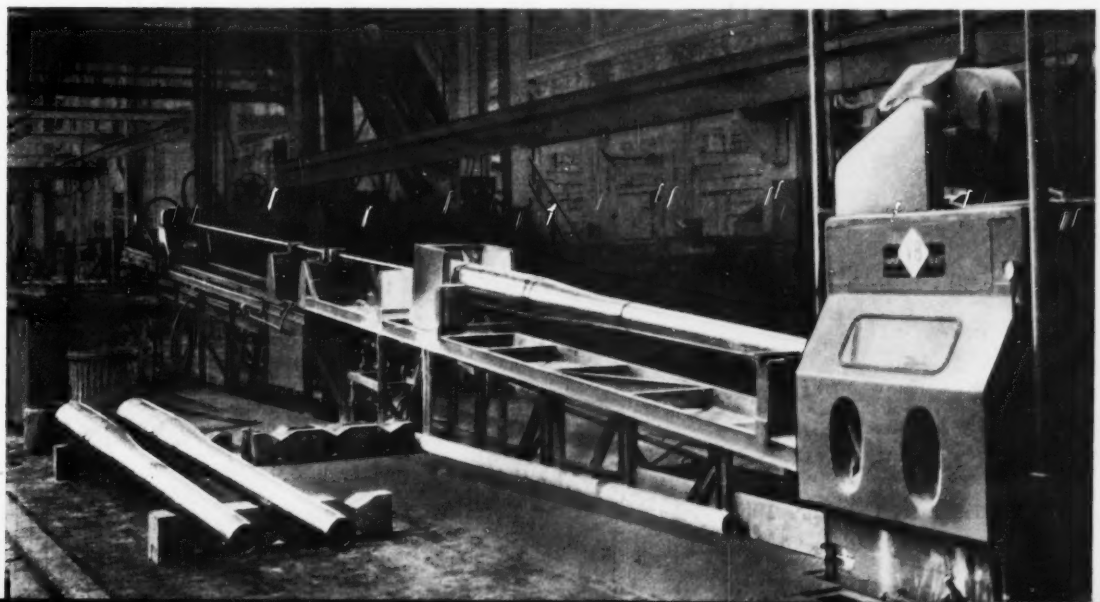


It was originally thought that the gun tubes would have to be degreased, but this treatment was found to be unnecessary. Internal surfaces of the gun tubes are prepared for plating by both mechanical and chemical treatment. Mechanical surface preparation is accomplished by "Liquid Honing," a finishing process developed by the Vapor Blast Mfg. Co., Milwaukee, Wis.

In this process, finely powdered abrasive, suspended in an emulsion of water and rust inhibiting chemicals, is discharged from nozzles against the gun tube bores. Treated surfaces are given a fine microscopic etched appearance, this smooth matte finish improving the adhesion of the subsequently plated chromium. Also, this treatment removes or blends tool marks in the tube bores, and eliminates microscopic metal "fuzz" or feathered edges from the rifled grooves.

Liquid abrasive finishing is performed on the special Vapor Blast machine shown in Fig. 2. The gun tube is angularly mounted on support blocks, and a blasting gun, mounted on one end of a long oscillating tube, is traversed through its bore. The abrasive solution, circulated in a hopper type cabinet (seen at the right) by means of a pump, is introduced—together with compressed air—at the opposite end of the oscillating tube, and discharged from nine equally spaced nozzles around the periphery of the blasting gun, as shown in Fig. 3.

Fig. 2. Special Vapor Blast machine for liquid abrasive finishing of gun tube bores. Treated surface has a fine microscopic etched appearance.



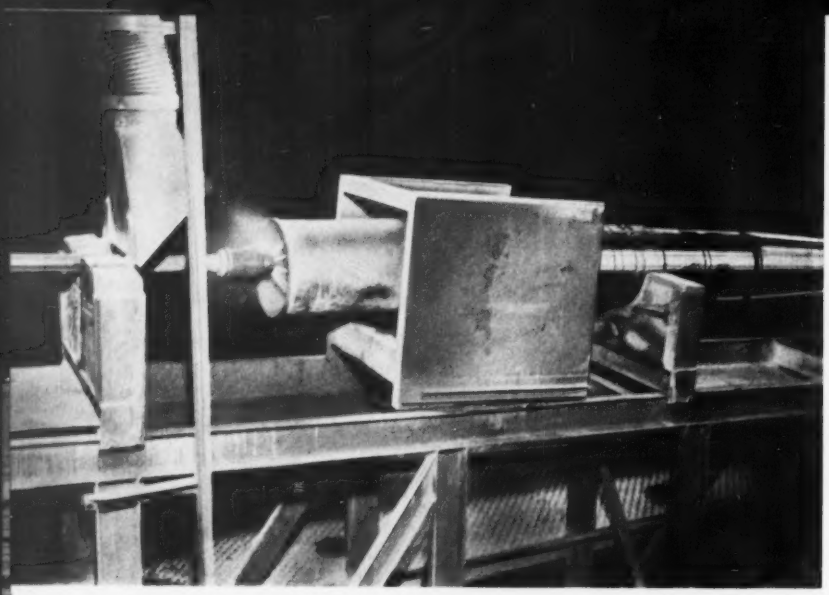
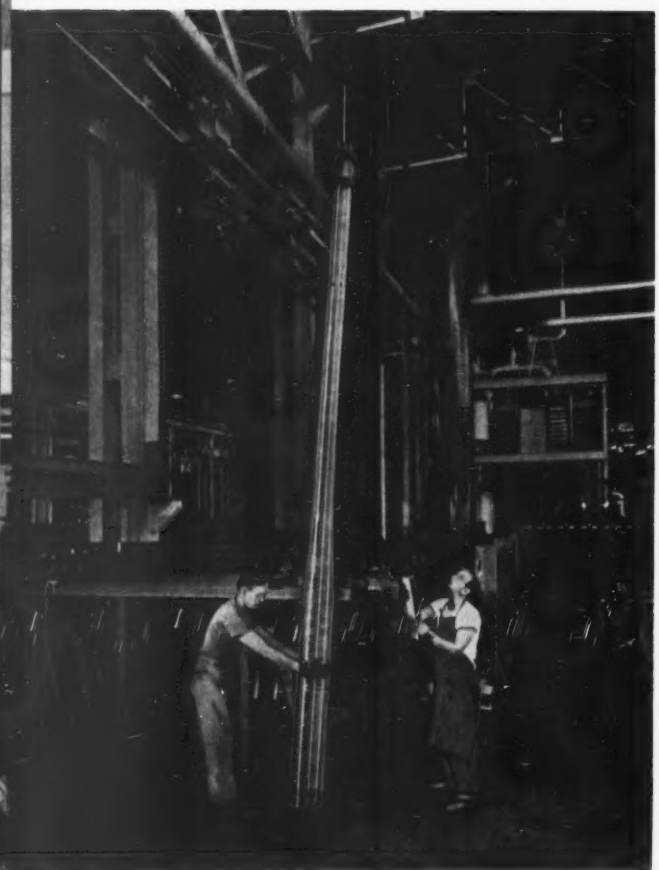


Fig. 3. On machine illustrated in Fig. 2, finely powdered abrasive, suspended in water, is discharged from nine equally spaced nozzles in blasting gun.

After completing the liquid abrasive finishing operation, and while the gun tube is still mounted on the Vapor Blast machine, the tube bore is flushed with cold tap water. Flushings are caught in a sump provided for abrasive separation. When the gun tube has been removed from the blasting machine, its bore is flushed free of abrasive grit with warm water.

Chemical treatment of the internal surfaces of the gun tube to insure good adhesion in subsequent plating is accomplished by means of a chromic acid dip. The tube is transferred to a 26-foot long by 3-foot wide and 3-foot deep tank containing warm chromic acid solution. After being immersed for several minutes in this solution, the tube is slushed by raising and dipping twice, and drained until the solution stops dripping by tilting one end slightly.



In preparation for chromium-plating, a lifting ring is screwed on the muzzle end of the gun tube, and the tube is picked up vertically by an overhead crane and lowered into a cathode fixture and anode assembly pit, as seen in Fig. 4. Here the lifting ring is removed, and the triangular-shaped cathode fixture is screwed on the muzzle end of the tube, Fig. 5. The fixture is made up of steel parts for strength and aluminum members (such as the clamp) for conduction of electrical current. Aluminum is employed instead of copper for the current-carrying members because this material is less subject to corrosion in chromic acid.

The anodes for chromium-plating the tank gun bores are made from steel, coated with sprayed copper, with the exception of a section at one end, which is solid copper. A lead coating covers the entire anode to protect it against corrosion. Although the anode extends throughout the entire length of the gun bore, its lower end is wrapped with plastic insulating tape so that the firing chamber will not be plated.

Also, a Koroseal sleeve is employed to cover the anode for protection of the rifling in the tube bore as the anode is carefully lowered into the tube, Fig. 6. When the gun tube is raised

Fig. 4. Lifting ring is screwed on muzzle end of gun tube so that tube can be lifted by overhead crane for transfer to assembly pit.

Fig. 5. With gun tube in assembly pit, lifting ring is removed and triangular-shaped cathode fixture is screwed on muzzle end.

from the assembly pit so that its breach end is at working level above the floor, this Koroseal protective sleeve is removed. While the tube is still in this position, a breech-end, anode-holding fixture is installed. This fixture, which contains a plastic disc with a central hole, centers the anode in the tube. A plastic ball on the lower end of the anode fits into the hole in the plastic disc on the centering fixture.

As the last step prior to chromium-plating, the gun tube bore is given a final cleaning, and its surface is prepared for optimum bonding of the chromium by reverse etching. The tube is lowered, by means of an overhead crane, into a 6-foot long by 4-foot wide and 30-foot deep tank, as seen in Fig. 7. This tank is filled with a warm chromic acid solution.

The thick aluminum bars at the top of the triangular-shaped cathode fixture, from which the tank gun tube is suspended, rest on copper pads at each end of the tank, illustrated in Fig. 8. For reverse etching, these pads are positively charged. Flexible leads secured to the upper end of the anode (cathode in reverse etching) are bolted to copper bus-bars on the sides of the tank. Then the current is turned on, and the tube bore is reverse etched for several minutes.

After turning off the current and disconnecting the cathode (anode in chromium-plating), the tank gun tube is transferred to the chromium-plating tank, 12-feet long by 4 feet wide by 30 feet deep. Electrical connections are made the same as for reverse etching, with the exceptions that the cathode is now the anode and that the copper pads on which the cathode fixture rests are negatively charged.

This tank is filled with a warm chromic acid and sulphate solution. The sulphate serves as a catalyst in the electrolytic process, and its amount must be carefully controlled—too little will cause oxides of chromium to form, and too much will result in less efficient operation with poor coverage. Chemical analysis of the solution is made daily to determine the chromic acid content and twice a week to check the amount of sulphate, additions being made as required.

The gun tube is kept immersed in the electrolyte for several hours, the exact time depending



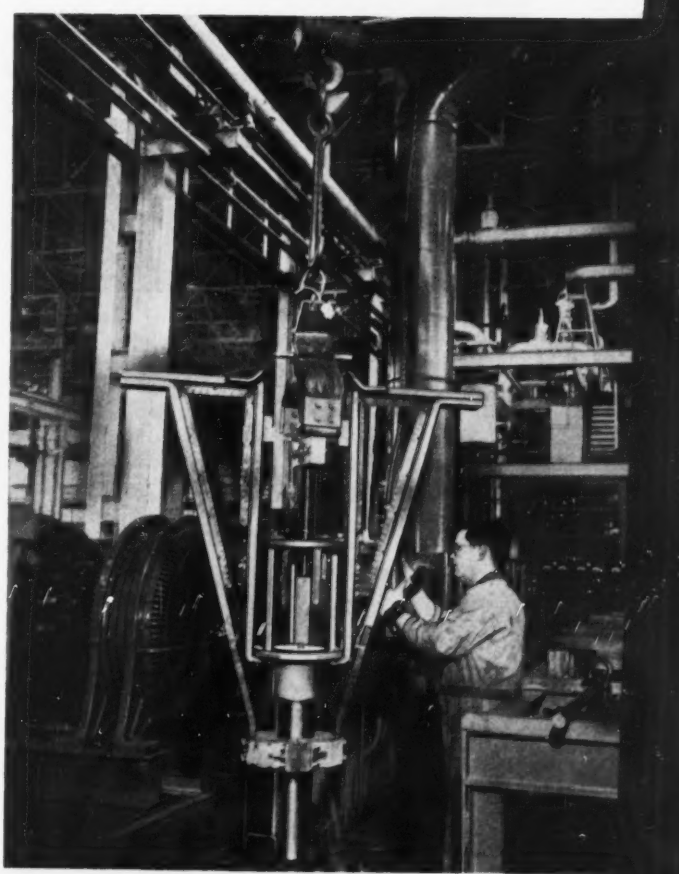


Fig. 6. A lead-coated, copper and steel anode, encased in a Koroseal sleeve to protect the rifling, is lowered into the gun tube.



Fig. 7. Subterranean view of a 90-millimeter tank gun tube being lowered into a 30-foot deep reverse etching tank for final cleaning and surface preparation of bore

upon the size to which the tube bore has been machined. Direct current is supplied for the reverse etching and chromium-plating operations by a battery of motor-generator sets. The characteristics of the electrical current supplied by each motor-generator set can be individually controlled by means of the control panels seen in Fig. 9. Each anode can be used to chromium-plate about 500 gun tube bores, and the cathode fixture is good for about 1000 tubes.

After turning off the current and disconnecting the anode contacts, the gun tube is transferred to a cold water rinse tank 4 feet square by 30 feet deep. The chromic acid is rinsed from the tube bore by raising and lowering the tube in the tank, and agitating the water vigorously by introducing air at the bottom of the tank. A depth of about 4 feet of bubbles is formed at the top of the tank by air agitation.

When the tank gun tube has been returned to the assembly pit, the breech-end anode-centering fixture is removed and the tube lowered into the pit. Then the anode and cathode assembly are removed, and the tube is lifted from the pit and inspected. The Borescope and star- and plug-gages are employed for this inspection. If excessive chromic acid residues are found in the bore, the tube is returned to a tank and flushed with hot water. Any subsequent machining of the chromium-plated bores is avoided whenever possible, but if they are under-size, honing is necessary. If defective plating—such as flaky poor deposits or "burning", which is



Fig. 8. Flexible leads secured to upper end of anode are bolted to copper bus-bars on sides of tank for etching.

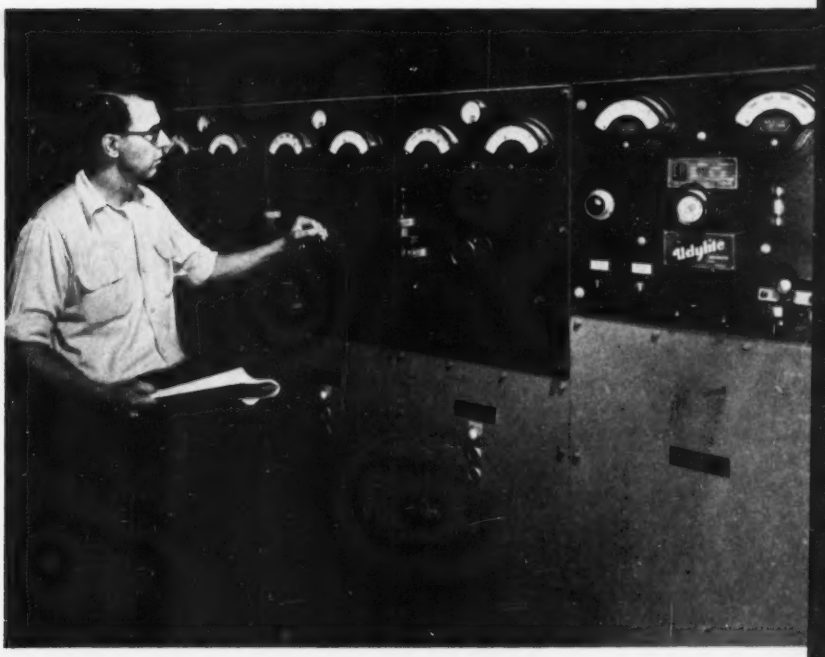


Fig. 9. Motor-generator sets supplying current for reverse etching, chromium-plating, and stripping can be individually controlled from panel.

denoted by a gravelly appearance—is present, the chromium plate must be stripped from the bore, and the tube replated.

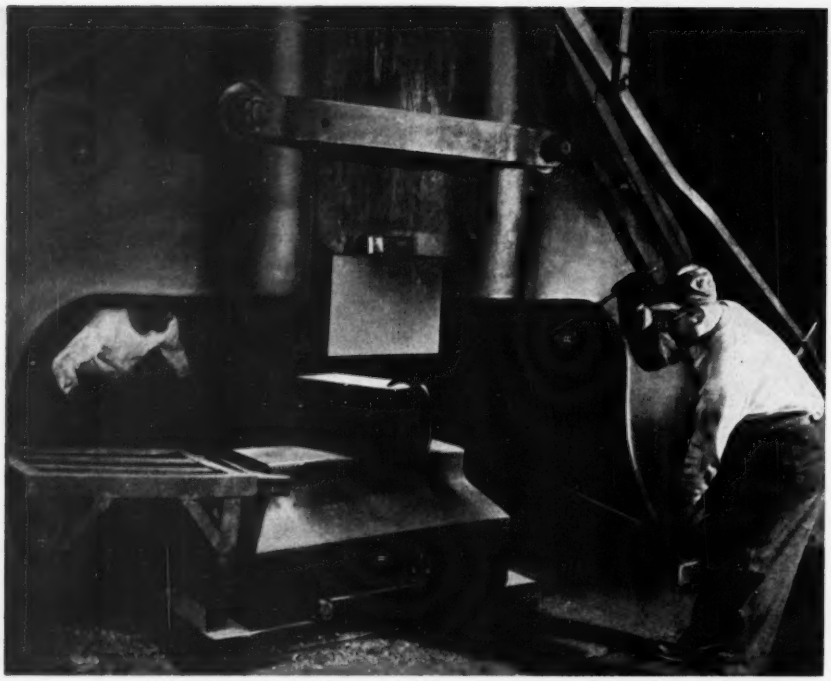
For stripping, a 2-inch diameter iron bar cathode (having no copper or lead coating) is assembled to each end of the gun tube. If the chromium plate to be stripped is thicker on one side of the tube bore, the stripping cathodes can be positioned off-center—toward the side of the bore having the thickest deposit—taking care to avoid any metal-to-metal contact. The gun tube is placed in the stripping tank, and the electrical leads are connected to the tank.

The tank is filled with a water solution containing stripping salts. The stripping solution is heated only when there are gun tubes that require this treatment, as the life of the bath will be shortened by maintaining the operating temperature unnecessarily. For stripping, electrical current is applied to the tank for several hours. The tube is then inspected. If additional chromium must be removed, the tube bore is subjected to as many additional stripping cycles as necessary, the bore being inspected at the end of each cycle. After rinsing the stripped gun tube in air-agitated cold water, the cathodes are disassembled and the tube is returned to the Vapor Blast machine for reprocessing as if it were a new tube.

The bright chromium-plated rifling of a 90-millimeter tank gun tube can be seen in Fig. 10, which shows an inspector checking the outside diameter of the tube. As previously mentioned, the hard chromium-plating effectively resists wear and corrosion, thus prolonging the useful life of the tubes. Tanks equipped with chromium-plated gun tubes and modern firing control apparatus have improved accuracy.



Fig. 10. Bright chromium-plated rifling in 90-millimeter tank gun tube is here clearly visible. Hard coating resists corrosion and wear.



Flat-Die Forging of Cast-Titanium Ingots

Conversion of cast-titanium ingots into wrought billets suitable for subsequent closed-die forging or machining has been a major problem. Experiences and recommendations of one company are described in this article

By J. F. NELSON, Chief Metallurgist
Kropp Forge Co., Chicago, Ill.

IMPORTANT experience in the quantity manufacture of aircraft and ordnance parts from titanium and titanium alloys has been gained in the last few years by the Kropp Forge Co., Chicago, Ill. To facilitate the production of such parts, this company's main plant in Chicago was furnished with a variety of new equipment, including a 40,000-pound drop forge hammer, a 4000-ton forging press, furnaces for heating the metals to forging temperature, and die-sinking and handling equipment.

One of the major problems encountered in the forging of titanium and its alloys is that of converting cast ingots to wrought billets suitable for subsequent closed-die forging or machining. An inherent quality of the as-cast ingots is an irregular, extremely hard outer layer. This hard skin is probably due to the fact that the induction-melted metals are cast in carbon crucibles. Surface defects must be removed before the ingot can be forged.

Hardness of the surface of the ingots makes it difficult to machine, and it was found more economical to grind the surfaces first and then turn them to the required depth. As much a 1/4 inch of stock is removed from the diameter of the ingot, 1 to 2 inches from the top and 1/8 inch from the bottom. Etching of the surfaces is performed to detect surface defects, which are removed by chipping or grinding.

The surface quality of cast ingots received from titanium producers has been constantly improving, and most producers now supply ingots already scalped. In such cases, the preliminary surface-conditioning operations described are not required and the ingots are ready for inspection and forging.

Most of Kropp's experience has been with alloy containing 5 per cent chromium, 3 per cent aluminum, and the balance titanium. Ingots from 6 to 18 inches in diameter have been forged to the desired billet size, with the average ingot measuring 13 inches in diameter by 17 inches long and weighing 445 pounds. The ingots are forged between flat dies on the 8000-pound steam drop-hammer which is shown in the heading illustration.

Another major problem in the forging of titanium is that the ingot cannot be forged at temperatures exceeding 1800 degrees F.—in contrast to temperatures up to 2300 degrees F. employed in forging ferrous alloys. When titanium is heated above 1800 degrees F., it rapidly increases in grain size, causing poor physical properties. Because of the lower temperature required, the ingots must be rapidly transferred from furnace to hammer, and the forging must be performed comparatively rapidly.

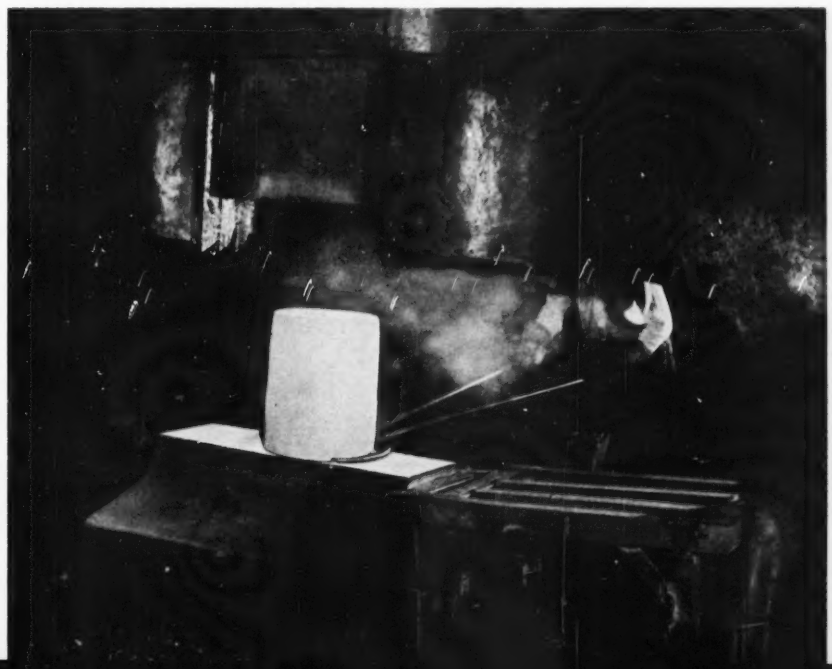
No apparent difference has been noticed in the ability of titanium to be forged when it is heated in electric, or gas- or oil-fired furnaces. Control of the atmosphere in the heating furnace is not necessary, but too oxidizing an atmosphere should be avoided. Also, it is essential that the furnace have a clean hearth. Therefore, the furnace hearth is scraped, the fire bricks are cleaned, and a platform of clean refractory bricks is built up on the hearth prior to heating. Without such precautions, exothermic reactions can melt the impurities in the titanium alloy. Also, iron scale in the furnace will cause rapid oxidation of the titanium.

Ingots are generally placed in the furnace when its temperature is about 1500 degrees F. Then the temperature is raised to between 1700 and 1750 degrees F. It is important not to heat the ingot above the maximum allowable temperature in order to avoid undue grain growth, and it is generally only necessary to hold the ingot at this temperature for a short time prior to forging.

The first step in converting a titanium-alloy ingot 15 inches in diameter by 14 inches long is illustrated in Fig. 1. The ingot is placed on the anvil with its axis vertical, and light hammer blows are applied with the flat die. These initial upsetting blows must be light and dispersed evenly over the entire surface because the cast ingot is sensitive to shock. Also, this procedure breaks up the cast structure gradually, insures soundness, and slowly develops the desired fiber structure and grain flow. At this stage, sensitivity of the hammer operator is extremely important, and it is often necessary to retrain personnel who are used to applying heavy blows on ferrous alloys. It is advantageous to avoid the use of over-size hammers, with which too much metal can be forged with each blow.

Upsetting is continued until the temperature of the forging is reduced to about 1450 degrees

Fig. 1. Cast-titanium alloy ingot 15 inches in diameter by 14 inches long has here been forged to a diameter of 16 inches.



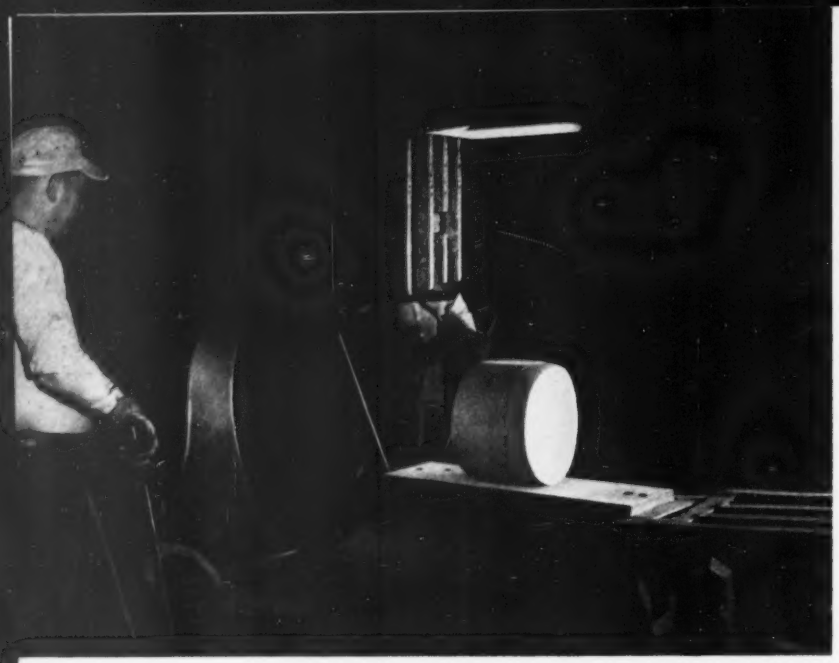


Fig. 2. After forging the ingot to a diameter of 20 inches, it is placed on its side for cross-forging in the normal direction.

F., this temperature being determined by optical pyrometers or on the basis of the operator's experience. Below this temperature, the material loses its plasticity and there is more danger of cracking the forging. When the forging reaches this temperature, it is returned to the furnace for reheating. The furnace is maintained at 1750 degrees F., since slow heating is not required in bringing the forging back up to temperature.

In Fig. 1, the 15-inch diameter of the ingot has been increased to 16 inches, and the 14-inch length decreased to about 12 inches. Upsetting is continued, with as few reheatings as necessary, to obtain a forging 20 inches in diameter and approximately 8 inches long.

The upset forging is then placed on its side, Fig. 2, with the original top surface of the ingot seen at the right and its axis perpendicular to the direction of the blows, and cross-forging is performed in the normal direction. In this reforging operation, the power of the blows applied is increased and a round-cornered forging 15 inches square is obtained with a new axis perpendicular to the original axis of the ingot. The forging is turned periodically, as shown in Fig 3 and the heading illustration, to take full advantage of the entire area of the flat dies and facilitate flow of the metal along the new axis.

Reheating is performed each time the forging cools to about 1450 degrees F., and careful inspections are made between successive operations. Any defects, such as laps or folds, are chipped from the forging as soon as they are found, as seen in Fig. 4.

Chain-operated tongs, Fig. 5, are attached to the forging to facilitate rotation. After one end



Fig. 3. Position of forging on anvil is changed periodically to facilitate the flow of metal along the newly created axis.



Fig. 4. Laps, folds, or other defects in the forging are removed by chipping as soon as they are detected.

has been forged to approximately a 7 1/4-inch square, the tongs are switched to this smaller end and the opposite end is forged to the same size, Fig. 6. In final sizing of the wrought billet, stop-blocks are placed on the anvil, Fig. 7, to limit the downward travel of the flat die. The final size of the round-cornered billet is 7 1/4 inches square by approximately 6 feet long.

Physical properties of the billet (which are higher than that of the ingot due to hot-working) depend upon the temperature at which finish-forging is performed, and the per cent reduction in size of the forging at this temperature. The lower the finishing temperature, the higher the physical properties of the billet. Although Kropp has air-cooled completed billets, most customers specify a slower cooling rate to avoid possible thermal stresses or ruptures. Such slow cooling is performed by burying the hot billets in limestone or placing them in a furnace, the temperature of which is gradually reduced to that of the room.

In drop-forging with closed-impression dies, titanium and its alloys readily fill the dies and produce sharp impressions. However, this material does have its own peculiar forging characteristics. Its resistance to deformation, or "stiffness," is greater than steel alloys, and hammers having about 25 per cent more capacity are required to forge comparable parts.

The procedure and precautions described for converting ingots into billets apply, in general, to the forging of preworked titanium. Surfaces of the part to be forged must be free from defects (usually accomplished by rough-turning), and the hearth of the furnaces employed for



Fig. 5. Chain-operated tongs permit rapid rotation of billet as it is forged into a square shape with rounded corners.

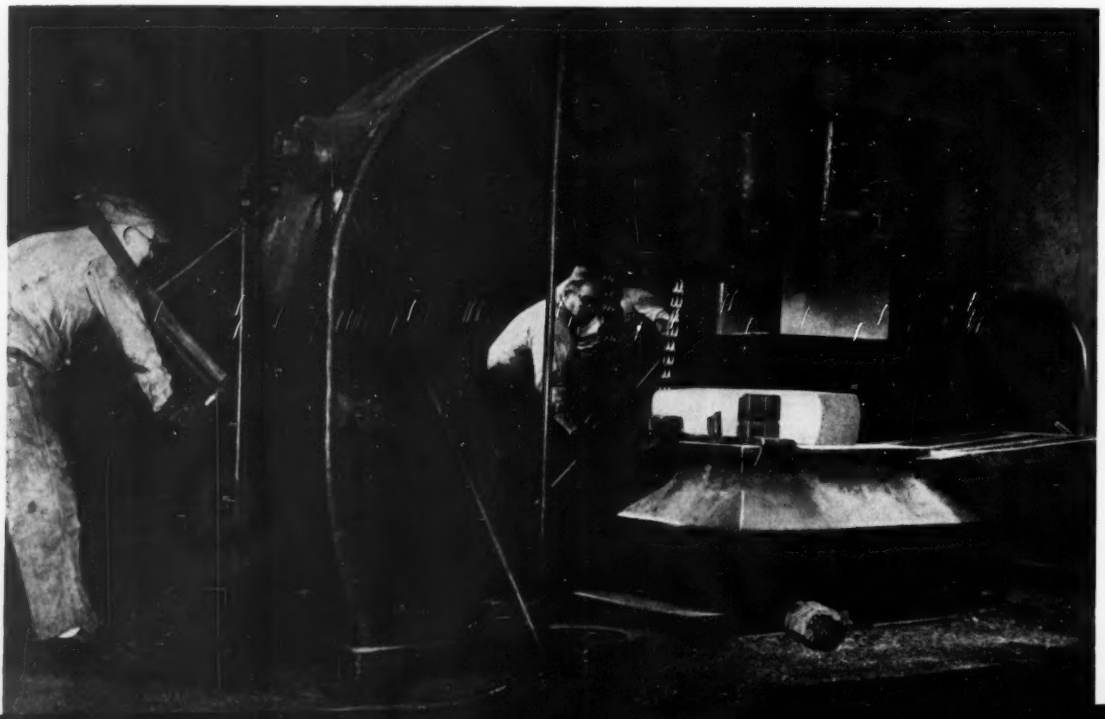


Fig. 6. Here tongs have been applied to the rough-forged end of billet and the opposite end is being hammered down to about the same size.

heating should be clean. Lower temperatures are usually employed for finish-forging to obtain higher physical properties. Dies having an exceedingly intricate impression, however, preclude the use of too low a temperature for finish-forging operations as the forging might freeze in the die.

Although dies designed for forging steel have been used to produce titanium parts, it is not considered good practice. One reason is that steel expands 3/16 inch per foot while titanium expands only 1/8 inch per foot; therefore different shrinkage allowances should be provided in the die design. Also, the dies should be more massive because of the greater force required to flow titanium. More generous radii, as well as increased draft (from 7 degrees for steel to about 10 degrees for titanium), should be provided because of the increased tendency of titanium to stick in the die as it cools. In general, the life of titanium forging dies is shorter than that of dies for producing steel parts because of the resistance of titanium to deformation and greater abrasive action.

Fig. 7. Stop-blocks on anvil limit downward travel of flat die in finish-forging. Completed billet is 7 1/4 inches square by 6 feet long.



Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Plastic Sheet	A3A	This material has punching and machining qualities similar to brass. It has a tensile strength of 11,900 pounds per square inch, is chemically resistant to acids, salts, and mild alkalies, as well as to most organic solvents.	Used in the manufacture of electronic and other parts where its physical properties prove most useful.
Drill Rod	Ace Drill Rod	A hardened and ground high-speed steel with a toughness equivalent to that of conventional tool steel and a hardness that is approximately 6 points higher on the Rockwell C scale.	Suitable for punches, knock-out pins, dowel-pins, rollers, plug gages, and tool bits.
Hard Rubber Compound	Ace Temperon	A heat- and chemical-resistant synthetic hard rubber compound that exhibits great rigidity. Large fittings may be produced by forming sheets of this material around cores or mandrels while still soft, prior to vulcanizing.	Available in the form of molded parts; and sheet, rod, and tube for machining a wide variety of shapes.
Buffing and Polishing Compound	Acme Greaseless Composition	The composition, when applied to a wheel face, adheres strongly to form a heavy fast-drying "head" which does not fly off and remains firm even in the warmest weather.	Used on brushes and buffing wheels to give good results in cutting, polishing, deburring, and satin finishing of all metals.
Metal Cleaner	Actane 33	When used in combination with sulphuric acid, it removes silica, sand, and scale from steel and can etch aluminum. When used with nitric acid and ferric sulphate, it can be used to pickle stainless steel.	For cleaning and pickling ferrous and non-ferrous metals. When used with nitric acid, it removes silicon and copper from aluminum to produce clean surfaces.
Aluminum Alloy	Alcoa C57S	When Alumilite-treated, it approaches highly pure aluminum in transparency, metallic luster, and sheen of its finish. It has good forming characteristics.	Can be used as a replacement for chromium and stainless steel in automobile or refrigerator trim and giftware.
Aluminum Tubing	Alcoa Utilitube	Made of Alcoa aluminum alloy B50S-O, it exhibits good flaring and forming characteristics. It bends more easily than annealed copper and work-hardens less under repeated bending. It also exhibits high resistance to corrosion.	Uses include: fuel, oil, gasoline, and lubricating oil lines for internal combustion engines; fuel gas lines for stoves and heaters; and air, vacuum, and hydraulic lines for brakes and instruments.
Aluminum Alloys	Alcoa XA54S Alcoa XC56S	XA54S, an aluminum-magnesium alloy has mechanical properties between those of 52S and 56S. XC56S is similar to 56S but has improved welding characteristics. Both alloys are weldable using the inert-gas metal-arc process (argon tungsten) or the semi-automatic inert-gas metal-arc process. Resulting welds are ductile and have high elongation.	XA54S is used for welded ship superstructures and barges; for pressure vessels and heat exchanger shells; and for bulk hauling equipment. XC56S is used for welded structures where strengths higher than those obtainable in 52S and XA54S alloys are required.
Aluminum Coating Process	Aldip	A dipping process for coating steels and other ferrous metals with aluminum to impart corrosion-resistant properties.	This process is used in coating heat exchangers, automotive mufflers, tail pipes, steel hangers, and paint rack fixtures.

For names and addresses of manufacturers of products listed, see end of this section

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Die Steel	**Alhead**	This steel can be water-hardened in the same manner as straight carbon or carbon vanadium steels and will have a case of equivalent depth and hardness. It contains 1 per cent carbon, 1 1/2 per cent tungsten, and 1 1/2 per cent cobalt.	Used for making cold-heading dies.
Chromium-Manganese Steel	**Allegheny Ludlum Chromium-Manganese Steel**	This steel exhibits good cold-working and non-magnetic properties, weldability, and ductility. As a result of a particular processing, it exhibited the following properties: yield strength, 113,150 pounds per square inch; tensile strength, 142,600 pounds per square inch; elongation in 2 inches, 21 per cent; and a hardness of 29 to 31 Rockwell C scale.	To be used where straight chromium steels are unsatisfactory substitutes for 18-8.
Silver-bearing Solder	**All-State No. 430**	The solder contains no lead, zinc, or cadmium, and can be chromium-plated. Some of the physical properties of soldered stainless steel, copper, brass, and other metals are tensile strength, 10,000 to 28,000 pounds per square inch; shear strength, 10,000 to 15,000 pounds per square inch; and elongation in 2 inches, 10 to 28 per cent.	Applicable by means of a soldering iron or torch. Its uses include electrical connections, corrosion-resistant assemblies and fabrications to operate at temperatures too high for lead-tin solders.
Die-casting Coloring Agent	**Aluminum Oxide Compositions**	These aluminum oxide compositions give castings a luster or color quickly.	For coloring zinc-base and aluminum die-castings. Can also be used to color steel.
Aluminum Coloring and Protecting Process	**Alumox 44**	The process which uses these salts gives color to and produces a protective coating on aluminum parts. Both the coating and dyeing occur simultaneously. The coatings produced are relatively non-conductive and have a thickness of approximately 0.0001 inch.	Applied by means of an immersion bath. Almost all aluminum alloys can be treated, including wrought and cast alloys. Objects treated include aluminum hardware, jewelry, nameplates, automobile trim, etc.
Phosphatizing Compound	**Anchorite 100**	This compound makes the surface of steel, iron, zinc, and cadmium parts resistant to corrosion and provides a base for organic coatings.	Applied by immersion or spraying, depending on production needs.
Stripping Oil	**Archer-Daniels-Midland Stripping Oil**	This material is said to be so stable that decomposition is negligible.	It is used as an oil-stripping medium for hot-dip tin and terne plating.
Hardening Compound	**Armor-Tuf**	This compound imparts a high surface hardness and wear resistance without developing toxic fumes.	For hardening low-carbon steels.
Metal-to-metal Bond	**Armstrong Adhesive A-6**	This thermosetting compound requires only contact pressure for joining. It cures at room temperatures and does not shrink, swell, or creep.	Particularly suited for bonding together many hard-to-bond metals, including aluminum.
Copper-base Alloy Stock	**Asarcon Alloys**	Available in rod, tubing, and many other symmetrical shapes from 7/16 inch to 5 1/8 inches in diameter or width and up to 20 feet long. These alloys, made by a continuous casting process are uniform both in texture and properties.	For many machining and fabricating operations that require uniform properties and are benefited by the use of symmetrical shapes with good, smooth surfaces.
Stainless Steel Marking Process	**Ateenate**	This process reproduces any design, character, diagram, or photograph on stainless steel. The marked surfaces are chip-proof, corrosion- and abrasion-resistant.	Useful in such applications as marking labels and instruction blanks for machinery and equipment.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Cutting Oils	Atlantic Cutting Oils 20 through 45	These non-rancid, non-staining cutting oils reduce friction, provide adequate cooling, and exhibit good anti-weld and metal wetting characteristics.	For multiple-purpose cutting oil applications.
Bluing Compound	Bearing Blue	A non-drying compound for use in spotting, scraping, and fitting of various machine component parts.	It is obtainable in 4-ounce cans for average shop use.
Ferrous Metal Blackener	Black Magic S.S.	Used in a one-bath process operating at a temperature of 225 to 260 degrees F. This blackener produces a lustrous adherent black finish which will not chip, flake, or peel from parts immersed from five to fifteen minutes in the bath.	For blackening stainless steel, and cast and malleable irons.
Barrel Burnishing Compound	Blue Magic Compound No. 0-221	This emulsion mixes readily with water, has no objectionable odor, is not irritating to the skin, and may be used repeatedly. It can be removed from the cutting medium or work by a water rinse.	Used to produce a hand-buffed appearance on metals wet tumbled in standard barrel finishing equipment.
Barrel Finishing Compound	Blue Magic Compound No. 1 (Double Strength)	A highly concentrated paste designed to be used in small quantities. It is said to yield uniform metallic colors and finish in short time cycles.	For roughing, deburring, cleaning, and finishing of brass, bronze, copper, gold, and silver stampings, castings, and machined and drawn parts.
Barrel Finishing Compound	Blue Magic Compound No. C-5	A non-dusting, non-irritating, soapy concentrated powder that has a detergency and rinsibility which causes the barrel finished parts to leave the tumbling barrel free from any foreign matter that might impair subsequent painting, plating, or other operations.	Can be used with any tumbling medium to obtain mirror finishes on alloy-steel parts in twenty to forty minutes.
Barrel Finishing Compound	Blue Magic No. S-12 Compound	A highly concentrated non-dusting white granular compound that is said to reduce deburring and finishing time.	For deburring and barrel finishing operations.
Brazing Materials	Braze-Clad	These silver brazing materials can be used to join ferrous and non-ferrous metals, similar as well as dissimilar. Voids and oxide islands are eliminated. The alloy is "anchored" through heating.	Typical applications include joints of large-area, pressure-tight joints, blind joints, and joints between powdered metal parts.
Cutting Compound	C-5 Cutting Compound	A compound which prevents galling and pitting of metal surfaces, permits high cutting speeds, and maintains uniform cutting temperatures. It has high temperature- and pressure-resisting qualities.	Recommended for boring, turning, tapping, threading, broaching, etc., stainless steel and other alloys.
Copper Alloy	Chase Tellurium Copper	This alloy has a machinability approaching that of free-cutting brass and an electrical conductivity 90 per cent of that of pure copper. It may be hot-worked and also severely cold-worked, although it is somewhat less ductile at room temperatures than pure copper.	It is well adapted for use in welding and cutting tip products, and is supplied in a hard or half-hard temper in the form of rod and bar.
Welding and Soldering Rod	Chemalloy	A cast triangular zinc rod containing aluminum, brass, lead, tin, silver, nickel, and other chemicals. No fluxing, cleaning, or other preparation is necessary prior to use.	Aluminum- or zinc-base alloys can be joined by soldering, brazing, or welding through its use.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Bonding Agent	ChemoTec	Formulated for joining metals to each other, to dissimilar metals, and to non-metallic materials such as ceramic, glass, or wood.	Available in rod, powder, paste, and liquid forms. It is said to be a new method of joining titanium, aluminum, and similar difficult-to-bond metals.
Chromizing Process	Chrom-alloying	Makes iron and steel heat-, corrosion-, and wear-resistant. The process transforms the ferrous metal surface into a high-chromium stainless metal or into a chromium carbide embedded in a high chromium-alloy matrix. The treated surface has a silver gray, satin smooth finish, which can be polished, lapped, or burnished into a high-luster finish at a slight sacrifice in corrosion resistance.	Can be applied to all kinds of cast, wrought, and machined irons and steels with the exception of high-speed steel and free-machining screw stock. Treated parts include tool and die components of forming tools, nuts and bolts that are subject to heat, etc.
Hard-facing Alloy	CM-199	Exhibits resistance to abrasion at high temperatures, the ability to withstand attack by molten copper, and good welding characteristics. Arc-welding deposits are non-porous and crackfree.	It has found successful application as a hard-facing for large guide rolls, hot friction guides, and soaking tong bits. Provides protection for the lips of copper converters.
Aluminum Alloy	Cond-Al	An aluminum alloy containing small quantities of iron, magnesium, and silicon that is light in weight and has high electrical conductivity.	For use in high-temperature applications such as field windings on steam turbine generators.
Copper-clad Steel	Conflex Copper-clad Hardenable Steel	This material consists of a layer of medium-carbon steel with a relatively thin layer of copper clad to one or both sides. It is highly conductive electrically and thermally, has good ductility for extreme forming, has good spring properties after heat-treatment, and exhibits resistance to corrosion.	For use in the fabrication of parts that require good electrical and thermal conductivity, spring characteristics, and ductility.
Lubricating Coolant	Cool-O-Lube	A concentrate which when mixed with water produces a non-injurious, smokeless, non-rancid, non-rusting coolant with high film strength, super-oiliness, and low viscosity.	For use in metal-cutting operations. Recommended for use with "Pur-o-luber" equipment but may be applied by conventional methods.
Copper-Silver Alloy	Copper-Silver Bronze	An easily machinable, high-strength alloy with high electrical conductivity containing 94 per cent copper and 6 per cent silver. When heat-treated, it exhibits tensile strengths ranging from 140,000 to 165,000 pounds per square inch. Its electrical conductivity (referred to standard copper) is 70 per cent.	Available in heat-treated and cold-worked condition. Used for spring parts requiring high electrical conductivity and also for watch and instrument parts which may be blanked from narrow strip.
Rust Preventive	Cor-In	Forms an adherent film of crystals that vaporizes and acts as a neutralizing agent, destroying the corrosive effect of all moisture or water vapor that comes in contact with it.	Applied by brush, spray, or dip. The part is wrapped or covered to provide the greatest protection. Protects dies and tools and parts in storage.
Rust Inhibitor	Crown Rust Inhibitor	An animal fat base rust inhibitor that has some lubrication qualities, will withstand normal handling, and is non-toxic, and non-inflammable.	Applied by spray or dip methods. This inhibitor can be used for all types of machined parts.
High-temperature Steel	Crucible 422	This ferritic or relatively low-alloy steel contains about 13 per cent chromium, less than 1 per cent nickel, and small amounts of vanadium, molybdenum, and tungsten.	Can be used in making bolts for turbines and other equipment subject to elevated-temperature operation.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Phosphatizing Material	Crys-Coat HC	This material provides a complex zinc phosphate coating that is crystalline in nature, and has a weight ranging from 200 to 1200 milligrams per square foot.	For coating iron and steel to promote adhesion of paint to the metals.
Lead-clad Copper	Cupralum	A lead-clad copper which exhibits the acid resistance of lead and the electrical conductivity and heat transfer properties of copper.	Used as anodes in the plating industry where great current flow from the anodes through the electrolyte to the work is desirable.
Die Lubricant	Dayton-Rogers Die Lubricant	This lubricant provides proper lubrication for the cylinder and piston and other working parts. In addition, it prolongs the life of cup packings on the die cushion cylinders.	Specially compounded for pneumatic die cushions. Available in 10- and 35-pound pails.
Plastic-armored Metal Tubing	Dekoron	Plastic-coated seamless tubing or plastic-coated tubing with welded, lap, or butt seams. It will not crack, chip, peel, or flake, and resists corrosion from salt air, moisture, oils, acids, and alkalies.	Now available in square, triangular, oval, and streamline shapes as well as the standard line of round shapes. It comes in a variety of sizes, colors, and finishes. Used in many industrial applications such as automotive parts, industrial instruments, and electrical lines.
High-speed and Die Steels	Desegatized Steels	These high-speed steels and die steels are free of carbide segregation and exhibit good hot-forming properties, good machining qualities, uniform response to heat-treatments, and toughness.	Used for those applications where its physical properties can be employed to best advantage.
Steel-cleaning Compound	Detrex 61	A high wetting, high penetrating, and free-rinsing compound that does not contain fatty acids or resin soaps. It removes oil, grease, and dirt from all ferrous parts.	Intended especially for use as a precleaner for steel that is to be deep-drawn or extruded.
Strippable Coating	Dip-Pak No. 637	This hot-melt plastic coating does not exude oil on standing at room temperature. It is tough, flexible, and strong; melts at 360 degrees F.	For permanent and temporary coatings on metal surfaces.
Silicone Release Agents	Dow Corning 7 Emulsion Dow Corning Mold Release Emulsion No. 35 Dow Corning 7 Compound	The two emulsions are of the oil-in-water type and can be diluted by the further addition of water. The No. 7 compound is a heat-stable, oxidation-resistant, grease-like silicone that retains its consistency over a temperature range of—40 degrees to over 400 degrees F.	Used in the sand-resin shell process of metal casting. The use of these agents permits the pattern plate to be utilized many times in the making of the molded shells, since there is a very small amount of build-up on this plate.
Magnesium Alloy	Dowmetal AZ91B	A magnesium alloy containing beryllium designed to lower melt loss and increase efficiency when using magnesium for die-casting.	Available in ingot form for the commercial magnesium die-casting industry.
Metal-forming Lubricant	Drawcote	An odorless non-inflammable protective and lubricating film is formed when using this lubricant.	Applied to metals prior to metal-forming operations by dipping or spraying. It is easily removed from formed parts by a hot, mild alkali bath.
Ferrous Metal Blackener	Dulite 3-0 Black	The compound is supplied in a dry-salt form and is mixed as needed. The maximum operating temperature required for processing is 240 degrees F.	Used effectively on stainless steels and also to produce a non-fading black finish on malleable iron.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Drawing Compounds	**Durpon Series**	Compounds providing optimum lubrication over long periods of time. They contain a stabilizing additive which prevents contamination of the drawing ingredient.	These drawing compounds, which are alkaline in nature, are used for wet-drawing nonferrous wire, rods, and tubes.
Lapping and Polishing Abrasive	**Dymo-C**	A diamond abrasive prepared especially for lapping and polishing carbide drawing and heading dies.	Available in the following National Bureau of Standards grades: 1, 3, 6, 8, 14, 30, 45, 230 mesh, 170 mesh, and 100 mesh.
Metal Cleaner	**Dynakleen**	This compound removes all types of foreign matter including grease, oils, and discolorations. It dries quickly and can be used repeatedly with only occasional filtration.	Designed specifically for the quick removal of buffing and drawing compounds from knurled or fluted surfaces of all metals. Also useful for preparing metal surfaces.
Plastic Rod	**Dynakon-F**	A plastic material of high tensile strength having good electrical and corrosion-resistant properties. It is resistant to acids and mild alkalies, as well as to salts and most organic solvents.	Used in making stand-off insulators, tension rods, chemical equipment supports, structural members subjected to corrosive atmospheres, and other parts.
Plastic Sheet	**Dynakon G1A**	A glass-fiber reinforced plastic sheet which resists the action of acids, salts, and mild alkalies, as well as organic solvents. Its tensile strength is 19,000 pounds per square inch.	Designed for applications in the electrical and chemical field where stress is encountered. It is available in sheets 18 by 28 inches in size in a variety of thicknesses.
"Weld-Through" Sealer	**EC-1168**	This aluminum-colored sealer is applied to faying surfaces by means of a calking gun, pressure extruding equipment, or scraper before spot welding, thus eliminating the need for a sealing operation after welding. It is a heavy paste-like material that is said to resist the heat and pressure of welding without splattering or burning.	Automobile manufacturers use this material to seal the spot-welded joint between the roof and side panels of automobiles. Another use is the sealing of seams of ventilating and air-conditioning ducts.
Copper Oxide Remover	**Ebonol "C"**	Converts the cuprous oxide on the surface of copper alloys to cupric oxide without attacking the base metal. Cupric oxide is then readily removed, using dilute sulphuric acid or sodium cyanide.	Applicable to pure copper, tin-bronzes, brasses, and various alloys containing silicon and aluminum.
Copper-clad Steel	**ElectroShield**	A base sheet of low-carbon magnetic steel that has chemically pure rolled copper metallurgically bonded on either one side or both sides. This material exhibits resistance to corrosion and low thermal expansion properties. It is ductile, easy to work, and can be resistance-welded, soldered, and brazed. Such operations as drawing, spinning, stamping, and punching can be performed on it.	Originally developed to provide improved shielding and housing of electronic equipment, its application has been extended to many other fields where products are made of copper sheet, such as the automotive, refrigeration, hardware, and chemical industries.
Metal-working Coolant	**Emulsifier STH**	A water-soluble, metal-working coolant which possesses good lubricating properties and can be used with both ferrous and non-ferrous metals and alloys.	Recommended for all types of metal-working machines that are employing coolant recirculating systems properly sealed for handling water emulsions in cutting, grinding, drawing, and stamping operations.
Rust Preventative	**Enthone Compound NR-31**	A mildly alkaline, water-soluble material used in a concentration of one ounce per gallon, in still or spray wash tanks for treating metal parts against rust.	Recommended for the prevention of rusting following cleaning, pickling, descaling, burnishing, and tumbling.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Rust and Scale Remover	**Enthone Compound 134**	This compound derusts and descales metals by using a periodical reversing current. Base metals are not attacked and a surface for hard chromium-plating is produced.	Used to remove black heat-treat quenching and other scales on alloy-steel parts, as well as carbon smut.
Rust and Scale Remover	**Enthone Descaler 2A**	An acidic compound that dislodges oil films, promotes fast pickling, and gives clean surfaces as a result of its descaling or derusting action.	For tumble or barrel derusting or descaling oxide and scale from steel and for primary pickling.
Metal Stripper	**Enthone Solder Stripper**	An alkaline chemical for dissolving tin, lead, and tin-lead alloys. There is no attack upon such base metals as copper, brass, bronze, steel, and stainless steels.	Used to remove tin, lead, and tin-lead electrodeposits, heavy solder, and hot-dipped coatings.
Aluminum Mesh	**Expamet Expanded Aluminum**	This mesh is made in a variety of metallic and opalescent colors in diamond-shaped and other style meshes. It will withstand corrosive attack by acids, and will not chip, peel, or flake.	Has many general and industrial applications such as machinery guards, partitions, and screening.
Lubricating Film Process	**Extrudite**	A process which consists of two warm immersion baths. The first forms a fine porous phosphate coating. The second impregnates this coating with a heat-resistant lubricant.	Used for the formation of a tough lubricating film on steels used for cold-forming.
Lead-clad Steel	**Ferrolum**	A lead-clad steel which has the sulphuric-acid resisting qualities of lead combined with the strength of steel.	Used in making containers, tanks, piping, etc., for handling such matrials as sulphuric acid.
Metal Degreaser	**Flo**	This solvent is relatively odorless, easy to handle and easy to use. It dries quickly without leaving any film or sticky residue and is non-corrosive.	For degreasing parts and engine and electrical accessories.
Plastic Cement	**Form-A-Jig**	This plastic cement compound holds parts together during welding operations. It will not soil, mar, or corrode the surface of metals to which it is applied.	Used as a substitute for a metal jig in cases where small lots are to be welded. May also be used in tool salvage.
Soldering Flux	**Fusion Electro-Tin TE-400**	A combination of organic, fast-acting fluxing agents and finely divided metal-tinning agents. These agents are non-acid and neutral but possess the characteristics of strongly active acid fluxes.	Originally for dip-tinning of transformer leads and dip-soldering of commutators, but has now found wide application in all fields of assembly where soft solders are used.
Cold Galvanizing Compound	**Galvanite**	For cold galvanizing the surfaces of steel and iron. Forty minutes after application it is tack-free and is completely dry in forty-eight hours.	Applied with paint brush, electric spray gun, or by cold dip on steel and iron surfaces.
Binding Resin	**G-E 12353**	This resin facilitates the molding of strong sand cores, has high water dilution and good handling characteristics by providing good collapsibility and easy shake-out.	When mixed with water and sand, it produces strong sand cores. As a spray it increases the hardness of oil- or resin-bonded cores to protect cores from breaking.
Welding Electrode	**G-E Type W-610-A**	A direct-current reverse-polarity rod meeting AWS Class E-6010 specifications. It has the ability to take high currents, together with freedom from reaction pitting and blistering of the coating, and assures a high ratio of inches-of-welding to inches-of-electrode used.	Typical applications include the welding of pipe and steam lines, ship structural frames, bridges, and unclad pressure vessels.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Abrasion-resistant Metal	Grade 608 Chrome Carbide	Exhibits high resistance to both corrosion and abrasion, has a coefficient of thermal expansion approximately the same as steel, is non-magnetic, and has resistance to high-temperature oxidation.	This carbide is used in the gage and instrument manufacturing field where wear resistance, temperature effects of expansion, and corrosion resistance are important considerations.
Stainless-steel Filter Sheet	Grade X	This filter sheet is ductile, has a tensile strength of 25,000 pounds per square inch and has a smooth surface. Thickness tolerances of plus or minus 0.002 inch are maintained in its manufacture.	The sheet material is available in thicknesses of 0.020 to 0.125 inch with a mean pore opening of 10 microns, and has a variety of uses.
Tool Steel	Graph-Mo Hollow-Bar	A turned and bored bar section using Graph-Mo tool steel for the basic material. Its machinability is comparable to that of gray cast iron, and it exhibits good wear resistance.	Available in stock sizes from about 3 to 16 inches outside diameter with the variety of wall thicknesses. It is used in manufacturing ring gages, dies, and other annular tool steel parts.
Metal Fasteners	GRC Rivets	These small zinc-alloy tubular and semi-tubular rivets are rustproof and corrosion-resistant. Rivets exhibit a tensile strength of 45,000 pounds per square inch.	Rivets are suitable for machine and hand applications, and are available in standard sizes, including diameters from 1/16 to 9/64 inch and lengths up to 3/8 inch, with oval or flat countersunk heads.
Abrasive Fabric	Gritcloth	A tough, open-mesh fabric with embedded abrasive which permits removed stock to float through the openings. The cloth is cleaned by rinsing in water.	Used wet, dry, flat, or folded on sanding machines, and by hand, for removing metal, wood, etc., in roughing or smoothing.
Tungsten Alloy	High-density Metal	Has a specific gravity 50 per cent greater than lead, and is readily machined with carbide-tipped tools.	Used to screen radioactive rays and to correct static and dynamic unbalance.
Hollow Tool Steel Bars	Hollow-Bar Tool Steel	These hollow bars of tool steel were designed to facilitate the fabrication of ring-shaped parts which are now being cut out of solid bars or special forgings. The hollow bars are furnished with machined surfaces.	For the manufacture of can dies, trim dies, liners, ring gages, and similar products. Available in the following tool steels: Airdi 150, Ketos, and Sanderson.
Metal Cleaners	Houghto-Clean 439, Houghto-Clean 440	These cleaners, the first, an oily liquid, and the second, a white powder when mixed with water, form solutions which clean metal parts and provide rust protection.	Uses include the removal of drawing oils, pigmented compounds, sulphurized cutting oils, and soils.
Tapping Lubricant	Hypertap	This stick-form tapping lubricant contains a cutting oil which serves as a coolant in tapping operations. It is stable in storage and withstand temperatures up to 100 degrees F. without softening.	For blind-hole tapping. It is said that finishing or bottoming taps may be used from the very start of the thread-cutting operation.
Nickel Alloy	Incoloy	Developed to conserve nickel supplies, it contains about 35 per cent nickel and 20 per cent chromium, with the balance iron. This alloy will fill many of the purposes served by the older alloys, some of which have a nickel content of 70 per cent.	Intended for use under conditions of high temperature and corrosion, it is produced in most standard, rolling mill forms, including sheet, strip, rod, wire, and tubing.
Cleaning and Phosphatizing Compound	Ion-Kote	A white, granular, dustless powder which removes most cutting and forming compounds, rust preventives, smut, and other dirts. It deposits a hard, dust-free phosphate coating on metal, which prevents rusting and increases paint adherence.	Applied by spray washers, it prepares steel and other metals for painting.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Free-machining Screw Steels	J & L "1200" Series	These steels are comparable in chemical composition and physical properties to the "1200" series steels listed by the American Iron and Steel Institute and "1100" series of the Society of Automotive Engineers.	Available in cold-finished bar form for making screws, nuts, studs, bolts, and other small machined products.
Nickel-plating Process	Kanigen	This nickel-plating process will plate uniformly, regardless of size or shape. A surface produced by the plating has a hardness range of 550 to 650 Vickers; very low ductility; and an electrical resistance of approximately 60 microhms per centimeter.	It has been used for the interior coatings of tank cars carrying corrosive chemicals and for bringing overmachined parts back to proper tolerances. It has also been applied to cast steel parts which substitute for similar parts made of Monel metal. Intricate valves difficult to plate can be covered thoroughly.
Aluminum Cleaner	Kelite PWB No. 81	A water-soluble detergent which removes virtually all types of soils. It is non-foaming, non-corrosive, and stable.	For the rapid cleaning of aluminum, anodized aluminum, and magnesium parts in power washing equipment.
Universal Cleaner	Kelite Spray White	It cleans rapidly without heat, odor, fumes, solvents, fire hazard, or danger to the skin by spraying and wiping. Hard rubbing or scouring is seldom required.	Applied by a hand-sized pressure spray gun. It safely removes grease, oil wax, dirt, ink, light carbon, and other objectionable deposits from a variety of work-piece materials.
Chemical Solvent	Kemisol A	When mixed in a solution of from 1/2 of 1 per cent to 1 per cent with water, it offers a thin, inexpensive solution which can be used in almost all methods utilized for cleaning metal parts. It is odorless, non-corrosive, non-toxic, non-inflammable, and harmless to the skin.	Used in the manufacture of ball and roller bearings and other parts prior to heat-treatment for cleaning parts before chromium-plating or lacquering, and for cleaning machined aluminum aircraft parts.
Cemented Titanium Carbide	Kentanium	This cemented titanium carbide resists oxidation at 1600 to 1800 degrees F., has a specific gravity range of from 3 to 4, a high hardness (Rockwell A 83 to 93), and an elastic modulus, or rigidity factor, about twice that of steel.	Used to make parts for elevated temperature service, such as turbine blades and nozzle vanes in gas turbines and jet engines.
Metal Cleaning and Phosphatizing Agent	Klem-Kote	This cleaning agent imparts an iridescent, crystalline, and adherent phosphate coating to the surface of metals. The phosphate coating produced retards rust and provides good bond for industrial finishes.	Successful applications of this compound have been made in automobile, refrigerator, and other industries.
General-purpose Oil	Kling-Oil	An SAE 30 viscosity oil having great metal adhesiveness. Not affected by the rubbing action of moving parts. No "gumming" or "build-up" is experienced after continued use.	Applied by methods ordinarily employed for oils in this class. Its use results in less dripping and spattering, and promotes safer, cleaner shop conditions.
Rubber-base Plastic	Kralastic	This plastic is unaffected by soil acids or alkalies, has good dimensional stability, and can be completely immersed in water for long periods of time without adverse effects.	Is used in the manufacture of corrosion-resistant plumbing for handling water and corrosive chemicals.
Brazing and Hard Soldering Flux	Kwikflux No. 94	This non-spattering flux with good penetration and protection properties is said to eliminate island formation, prevent oxidation and scale, and protect and clean metal surfaces.	Can be used with all standard silver, brass, bronze, and other hard solders, and with all types of heating methods including direct, indirect, and induction heating.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Primer	**Lankote PR-1**	This coating adheres to metals with a bond that is half mechanical and half chemical due to the etching action of the acid diluting agent. It is supplied as two components which are mixed prior to use.	Applied by spraying, brushing, or roller-coating. It is air-dried or baked in a few minutes. This coating may be used on those surfaces which normally require phosphatizing, Parkerizing, or bonderizing.
Lead-bearing Steel	**Leaded TS 4140 Modified**	This steel will machine one-third faster than the comparable non-leaded grade applications.	Is available cold-drawn in various size ranges in rounds and hexagons.
Corrosion- and Heat-resistant Coating	**Leafcote**	A tough adhesive coating that will not peel or crack in drawing or forming operations.	It is applied to both sides of cold- or hot-rolled sheet steel for corrosion resistance.
Cooling and Lubricating Compound	**Lubri-Cut**	This compound is fire-resistant and free from abrasives and acids. It clings to the tool to produce an effective cooling and lubricating action.	It is used in high-speed drilling, blind-hole tapping, countersinking, profile routing, swaging, etc., on metals, plastics, and glass.
Polyvinyl Plastic	**Lucoflex**	This plastic resists the action of most solvents, brine, and other corrosives. Exhibits a metal-like machinability and can be fabricated by all the usual processes, i.e., milling, boring, welding, etc. Is not affected by aging at elevated temperatures, and can be etched with vinyl inks that provide a permanent coloring.	For making nameplates, instrument panels, and imprinted dials. Screws for mounting are also made of this plastic.
Copper-clad Steels	**Lukens Copper-Clad Steels**	Carbon steels clad on one side with either high conductivity copper for electrical applications or phosphorous deoxidized copper for welding applications.	Used in the fabrication of electrical apparatus, evaporators, tube sheets, hot water heaters, heat exchangers, and tanks.
Foundry Sand Resin	**Lustrex 886**	By eliminating the formation of clay balls from foundry sand, it improves sand workability. Also eliminates most of the cracks, fissures, and soft spots characterizing untreated sands.	Can be used in the ratio of 1 pound of resin to 1 ton of foundry sand for all types of foundry operations.
Metal Cleaner	**Magnus 751**	This non-inflammable metal cleaner penetrates, loosens, and removes all foreign deposits, including paints and other types of coatings.	Uses include the removal of carbonized oil and gums from rear-end transmissions, brake parts, automotive engine parts, and the cleaning of other components.
Cutting Fluids	**Magnus Cutting Compounds No. 6 No. 7 DO-1A DO-4A**	For difficult machining operations, compounds Nos. 6 and 7 are used. Where cooling is an important factor, DO-4A and DO-1A are recommended. These soluble oils also give rust protection and minimize the occurrence of rancidity and dermatitis. They do not "gum up."	For machining operations on stainless steel, high-carbon steels, and other metals that are difficult to machine.
Die Stock	**Masonite Die Stock**	This product has greater uniformity of strength than previously, and contains less than 3 per cent voids. It weighs less than one-half as much as aluminum and one-sixth as much as steel.	It is used in aircraft and other industries for experimental tooling, mock-ups, and models. Available in large panels in thicknesses of 1/4 inch to 2 inches.
Plastic Fillets	**Master Universal Fillets**	These fillets are impervious to moisture, core oils, and liquid partings; and can be coated with shellac, lacquer, or any recognized pattern coating. They are durable, do not dry out, and maintain their dimensions under normal conditions.	Used in patternmaking to provide fillets for wood or metal patterns and core-boxes. Will conform to almost any shape or surface.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Metal-cutting Agent	Metalloid X-30	This agent employs as a catalyst an organic compound which is said to be non-staining and transparent. The cutting agent is odorless and non-toxic. It employs any regular paraffin or naphthenic cutting oil as its vehicle and may be used in ratios as high as 4 to 1.	Applications include the manufacture of silver bearings and other alloys where processed cutting agents have not been previously permissible because of staining characteristics. It is suited for grinding operations as it is transparent, permitting close scrutiny of work.
Brazing Material	Mo-braze	A powder which melts at a temperature of approximately 3450 degrees F. and forms a continuous, strong braze upon solidification.	Used in the high-temperature brazing of molybdenum and tungsten electronic components.
Lubricating Enamels	Molynamel	Solid lubricant films of these enamels are tough, adherent, and dry. They have a molybdenum base, and can be applied to any machine or instrument surface by employing ordinary brushing or spraying techniques and equipment.	For lubricating optical and electronic apparatus. Other uses are on tables of band saws, drilling machines, etc., where surfaces must be clean and oil-free.
Masking Tape	Mystik Brand Thin-flex Masking Tape No. 6207	Exhibits a positive holding quality at high temperatures, leaves no residue upon stripping, and performs under adverse weather conditions.	For all masking operations.
Aluminum Solder Rod	No. 37 Aluminum Solder Rod	Properly applied, it will withstand pressures of 1000 pounds per square inch. It melts at 400 degrees F. and flows at 450 degrees F. and is lead-free. It gives good matching color and is corrosion-resistant.	Applied by soldering iron or indirect heating in such applications as electrical signs, television and radio parts, etc. Used on all types of aluminum except 24S-T, and can be employed for soldering aluminum to dissimilar metals.
Wax Lubricant	No. 140 Stik-Wax	A blend of solid waxes put up in stick form provides a durable, clean lubricant for metal-working operations.	Applied manually or automatically, it is used for metal-sanding, metal-sawing, drilling, tapping, etc.
Silver Brazing Flux	No. 1200	This flux melts at a temperature lower than the melting points of the brazing alloys employed and forms a coating of fused salts over the brazing area. It prevents oxidation of the surface during heating, brazing, and cooling; cleans and floats off dirt or oxides; and reduces surface tension of the molten alloy so that it flows freely.	For silver brazing ferrous and non-ferrous metals.
Metal Cleaner	Oakite Composition No. 26	It possesses the ability to wet and penetrate heavy soils quickly which are removed by subsequent rinsing. No insoluble or oily films are left on surfaces after rinsing to interfere with painting or plating.	Typical applications include removal of pigmented drawing compounds, solid-particle dirts and smuts; cleaning before vitreous enameling; and precleaning buffed metal before electroplating.
Paint Strippers	Oakite Compositions No. 56 and No. 57	These strippers contain no phenols, cresols, acids, or alkalies, and can be used safely at full strength and in an unheated condition.	Designed for tank immersion stripping and brush-on stripping of a variety of alkaline-resistant paints and lacquers.
Aluminum Etchant	Oakite Composition No. 60	Gives a controlled etch of any desired depth while imparting a velvet-like appearance to the surface. Does not form a hard scale build-up on tanks and coils.	For etching aluminum uniformly without excessive foaming.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Soft-metal Cleaner	Oakite Composition No. 80-A	This composition, which may be used in soak tanks or pressure spray washing machines, is readily soluble in hot water and rines off with hot or cold water.	For cleaning aluminum, tin, and other soft metals in aircraft and metal plants where good cleaning and safety are essential.
Die-casting Cleaner	Oakite Composition No. 95	This composition removes surface films, disturbed metal, and traces of soil which are among the major causes of peeling, blistering, and dulling of electroplates.	For electrocleaning zinc-base die-castings prior to plating.
Metal Cleaner	Oakite Compound No. 31	A highly concentrated liquid detergent which cleans, derusts, and gives a phosphate coating in a single operation.	For prepaint treatment of metals, including aluminum sheet and aluminum castings.
Wear Strips	OK Wear Strips	These strips, consisting of a machinable steel base with a wearing surface of aluminum bronze, have surfaces that are ground to close tolerances.	Available in assorted sizes these strips are used in the fabrication of machines and other general wear applications.
Jet Black Finish	Parco Black	This product is used in water solutions to produce a jet black finish for iron and steel that has good corrosion resistance.	For iron and steel parts including those that are machined or threaded. The surface is oiled or waxed before service to produce a deep black durable finish.
Molding Compound	Parker Compound 90	A rubber synthetic molding compound which has high heat resistance (up to 225 degrees F.), low compression set, and high hardness.	Used for making O-ring seals for tanks and other military vehicles.
Anti-rust Paints	PCA-100 PCA-101	Two penetrating and sealing anti-rust paints that can be applied directly over rusted surfaces. Paints penetrate through the rust layers into the base metal and seal the surface against further rusting.	May be applied by brushing or spraying, for interior or exterior use. PCA-100 is black, and is recommended as a finish coat. PCA-101 is clear and can be painted over.
Honing Coolant	Pelron No. 560	This coolant combines the heat-dissipating qualities of water with the cleansing and anti-rusting qualities of kerosene. It contains a high percentage of liquid detergent, an extreme-pressure agent, and a rust preventive.	A water solution of this compound is used as a coolant for many metal-honing operations.
Rust Preventive Additive	Petrobase 210	A synthetic rust preventive additive for petroleum oils, petrolatums, and waxes. This compound causes oils and waxes to displace water from metal surfaces and prevents redeposition of aqueous vapors or liquids on the metal surface.	Used mainly in the following classes of oils: Preservative oils and compounds; industrial preservative or "slushing" oils; and oils used to lubricate small motors, hinges, and tools.
Laminating Material	Phenopreg LP-502	A tacky, low-pressure laminating material composed of glass fabric impregnated with General Electric Permafil resin. Although tacky, it is easy to handle and does not deposit resin on the user's hands.	For making molding lay-ups of aircraft tooling jig fixtures without the use of staples or other fastening devices. These lay-ups may be made of wood or plaster forms.
Bonding Solution	Phospray	A cold-spray bonding solution which does not require such preparatory steps as cleaning, rinsing, drying, etc. It dries immediately upon spray application.	For all metal products except aluminum. It can be used in the proportion of three parts of thinner to one part of solution.
Casting Impregnation Process	Polyplastex "MC"	A process for the impregnation of castings to make them impervious to the corrosive attacks of non-inflammable hydraulic fluids, as well as to insure the elimination of micro-porosity.	Used to impregnate parts in systems that employ hydraulic fluids and also to impregnate mortar shell castings.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Stainless Steel	**Powdered Stainless Steel**	Powdered prealloyed stainless steels available in AISI Types 316, 304, 302-B, and 431.	For fabrication of filters, self-lubricating bushings, and water meter parts.
Metal Cleaner	**Powrite**	This rust-inhibiting compound which is dust-free, granular, water-soluble and low-foaming may be used in power washers, tanks, or spray booths in concentrations of 1/2 to 4 ounces per gallon of either hot or cold water. Rinsing after cleaning is unnecessary, although advantageous for some applications.	Used for removing oil, dirt, chips, and abrasives from all types of metal surfaces. Other uses include cleaning before phosphatizing; maintenance cleaning of paint; and conditioning hard water.
Hydraulic Fluid	**Pydraul F-9**	A fire-resistant, non-corrosive, non-inflammable, chemically stable hydraulic fluid that exhibits good lubricity and is easily pumped	This fluid can be used in such equipment as die-casting machines, hydraulic presses, hydroelectric turbines and glass drawing machines.
Scale and Rust Remover	**Quick Pik**	A water solution of this dry acidic salt mixture minimizes the attack of the acid on the base metal and produces a foam which covers the surface of the solution, eliminating acid spray and reducing fumes to a minimum.	For removing scale and rust from all types of ferrous metal parts.
Resin Accelerator	**Quick-Set**	Casting resin can be hardened quickly without heat by the addition of this liquid accelerator.	Used in the production of master models, duplicating and foundry patterns, and jigs and fixtures.
Cast-aluminum Plates and Bars	**Reynolds Cast-Aluminum Plate and Bar Stock**	These plates and bars exhibit a tensile strength of 25,000 pounds per square inch, as cast; an average Brinell hardness of 70 (B scale); and an elongation of 0.5 per cent in 2 inches. They are easily machined and can be welded.	Plates are used for the construction of hydraulic press form-blocks, hydraulic stretch-forming dies, jigs, fixtures, and other tooling. Large-sized cast-aluminum bars find application as fixture bases on spar mills.
Corrosion-resistance Coatings	**Ricwilite 1060 Ricwilite 7100**	The first of these two phenolic resin coatings is a heat-hardening type which forms a chemically inert, insoluble, corrosion-resistant coating that is hard and tough, glass-like in appearance, yet flexible and elastic. The second is a cold-setting type with similar properties.	Used in the production of ventilating and duct systems, drill pipe, piping and equipment in food and chemical process plants, oil refineries, pulp and paper plants, and storage tanks.
Cleaning and Phosphatizin Compounds	**Rustclean 12 Rustclean 15**	These compounds remove rust, tarnish, and light oil, and chemically prepare metals for paint. They contain a mild acid which offers very little hazard to personnel. The compounds do not produce fumes or emit toxic vapors.	For cleaning the surfaces of steel, iron, aluminum, zinc, and cadmium, and for forming a phosphate coating which will act as a base for organic finishes.
Anti-rust Paint	**Rust-Cure**	Rusted surfaces can be sealed and further rusting action retarded by use of this paint. It can be applied on rusted surfaces without wire-brushing, scraping, or sand-blasting.	Applied by brushing, dipping, or spraying methods. It is available in black, aluminum, and clear compositions for painting machinery and buildings.
Phosphatizing Compound	**Rustshield 2**	This chemical treatment produces a non-metallic coating which, besides being rust-proof, is absorbent, thus serving to retain lubricating oils. Close tolerances are not affected by the treatment.	For rustproofing, rubbing and sliding surfaces of iron and steel parts such as thrust washers, pump pistons, gears and valve roller pins, etc.
Hammer Finish Enamel	**Sanco Hammer Finish**	This enamel is easy to apply, has uniformity of pattern, is chip- and scratch-resistant, and does not require the use of a primer.	Available in a wide variety of colors. The enamel is applied by spray methods.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Metal Bonder	Seal-All	A compound that adheres to any metal, toughens with age, and never becomes brittle. It is said to be unaffected by gasoline, oil, naphtha, alcohol, or water.	This product bonds metal, wood, glass, etc., and has been used successfully to impregnate castings for the prevention of leaks.
Coolant-lubricant	Shear-Speed Soluble Oil	A non-rancid, odorless, stable soluble oil that contains an additive to protect the operator's hands against dermatitis.	For use in practically all types of metal-cutting, grinding, and forming operations.
Aluminum Paint	Sheffield Super-Hot	It will add a protective and decorative finish to metal surfaces withstanding temperatures of 1600 degrees F. The greater the heat, the more permanent the bond. It maintains its brilliance, will not crack, chip, or peel, and is impervious to most ordinary solvents.	Applied by brushing, spraying, or dipping, it dries within thirty minutes, after which time heat can be applied. It is used to paint any metal surface that is subject to heats of from 500 to 1600 degrees F.
Lithium-base Grease	Shell Alvania Grease	This grease has a high water tolerance, broad operating temperature range, high pumpability and movement at low temperatures, low rate of oxidation, and good storage stability.	Used for many purposes where its specification properties are required. Its high pumpability and movement at low temperatures make it applicable for automatic grease systems.
Lubricating Oil	Shell Rimula Oil	An additive-containing oil that extends the service life of industrial engines by cutting down engine wear resulting from corrosion and fouling.	Best for Diesel engines operating on low-grade fuels and on engines operating at low loads intermittently with high-sulphur fuels.
Die Steel	Simonds Air-Hardening Die Steel	An air-hardening type of flat ground die steel which has good wear resistance and a wide hardening range which simplifies heat-treatment. Its spheroidized microstructure provides good machinability.	Available in forty-three standard stock sizes, this steel is used in making punches and dies.
Soldering Flux	Stainless Steel "48" Soldering Flux	This flux removes oxides without affecting the corrosion-resistant properties of the metal, promotes high capillary action of the solder, is displaced from solid metal by the molten solder, and its residue can be easily removed with water.	Is used with the solder-iron, flame, or dip methods of soldering stainless steel; Monel; Inconel, Nichrome; and chromium, manganese, molybdenum, tungsten, and vanadium alloys.
Aluminum Etching Compound	Star Etch	Production of a uniform control etch is possible by either dipping or mechanical spraying.	It helps to solve the problems of foaming, sludging, and hard scale formation encountered in aluminum etching operations.
Air-hardening Flat Stock	Starrett No. 497 Air-Hardening Flat Stock	A precision-ground flat stock made to a special analysis for hardening in air. It maintains its dimensions during heat-treatment and is fully spheroidized for easy machining.	Recommended for punches and dies used in long-production runs or for stamping silicon, stainless steel and Monel.
Ductile Powdered Metal	Steel Oilite	An iron powdered metal having the ability to withstand high stresses without cracking. It exhibits great ductility and its physical properties are comparable to that of mild carbon steel. It can be plated by any of the normal processes and can be hardened by direct quenching, or carburized and hardened.	For machine parts such as gears, cams, brackets, and lever arms where ductility and strength are required.
Protective Coating	Steelast	This multi-colored coating is impervious to moisture, resistant to most chemicals, odorless, and non-toxic when dry. It will withstand constant wet heat up to 180 degrees F. and constant dry heat up to 300 degrees F.	Can be applied to rusted and bare unrusted treated surfaces, and painted surfaces of machinery, pipes, tanks, duct work, and metal building materials by spray, brush, or dip methods.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Rust Preventive	**Stop-Rust No. 0 Special**	A coating of this preventive absorbs entrapped moisture on the surface of metal, floats it out to the coating surface, and evaporates it.	Applied at room temperature by brushing, dipping, spraying, or wiping on. It is readily removed by commercial solvents such as Stoddard solvent or kerosene.
Extreme-pressure Lubricant	**Sunep**	A lubricant which is available in several viscosities and is non-corrosive, has long life, acts as a rust preventive, and adheres well to gears.	Suitable primarily for enclosed gears but also effective for bearings and screws working under extreme pressures and in gear-reduction units.
Lead-bearing Steel	**Super La-Led**	An easily machinable open-hearth steel containing about 0.25 per cent lead and nearly 0.50 per cent sulphur.	Used where good machinability is required and in some instances may be employed instead of brass where corrosion is not a factor.
Metal Cleaner	**Super-Mul**	A high-strength active solvent emulsion cleaner which rinses freely, resists hard water, and does not sludge out with heavy soil loads.	Recommended uses include metal cleaning in one-stage washers and cleaning prior to bonderizing, during processing and before painting.
Die Steel	**Super Samson**	This steel is capable of being cold-hobbed and exhibits a high core strength and resistance to heat and abrasion. Its rate of work-hardening is somewhat lower than that of some of the other hobbing grade steels.	For die cavities used in die-casting zinc, aluminum, and magnesium, as well as molds for plastics requiring temperatures up to and including 800 degrees F.
Protective Coating	**Tarlac**	Exhibits the protective and adhesive qualities of coal-tar pitch and is impervious to oils, greases, and other petroleum derivatives, alkalies, acids, etc. Will not crack or run within a temperature range of —56 degrees to 200 degrees F.	Used as a protective coating for concrete structures, floors, masonry, and metals exposed to corrosive elements. Its tough, enduring, flat black film is completely insoluble in water, oil, or gasoline.
Drawing Lubricants	**Ten Series**	These lubricants possess adhesive and heat-resistant qualities, which make it possible to maintain a tough, even, unbroken film around the metal under extreme pressure and heat conditions. They contain no fatty acids or sulphur, are safe for operator's hands, and will not separate out or become rancid.	Used in drawing, forming, stamping, cutting, and piercing operations on stainless steel and other hard metals.
Welding Electrodes	**Tensilend 100 (Grade 230)** **Tensilend 120 (Grade 260)**	Standard welding quality mild steel cores covered with an electrode coating containing powdered nickel, ferro-molybdenum, and ferro-vanadium which produce weld metals of tensile strengths over 100,000 pounds per square inch.	Used in welding high-strength steels and armor plate, they replace electrodes containing critical metals.
High-nickel Alloys	**Thin-Gage High-Nickel Alloys**	Characteristics of these precision rolled thin gage alloys include low expansion, high permeability, and high electrical resistance.	Typical uses include the manufacture of speedometers, navigation instruments and telemetering devices.
Welding Compound	**Thompson Anti-Spatter**	Two types—No-Clean (SO-327) and Pickle-Off (SO-317). The first provides a firm foundation for paint and need not be removed before priming. The second is for use with chromium or stainless steel and where the job is to be pickled. The compound is used in all kinds of weather, causes no glare, has no disagreeable odor and is easily removed.	For all general welding applications especially where pickling is to be done and where chromium or stainless steel is used.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Stick-type Wax Lubricant	**Tool-Saver**	A mixture of wax ingredients designed to reduce the friction and the heat accompanying machining operations.	For use on such tools as saw bands, knife bands, circular saws, hacksaws, twist drills, etc.
Cutting Compound	**Triple-Chip Soluble Oil**	This oil withstands high heat for long periods, adheres to the tool, mixes readily with water, and resists contamination. It is said to keep chips from "welding" to the tool and flying from the work-piece.	Used for sawing, slitting, and slotting operations, it is odorless, smokeless, non-corrosive, and maintains its properties while in storage.
Tumbling Compound	**Tumb-L-Magic**	This compound suspends grease and cuttings in the tumbling solution, thus keeping work surface and abrasive media free from action-retarding accumulations.	For use in conventional tumbling equipment, it enables a high finish to be produced on metal and plastics.
Vinyl Primer	**Tygorust**	It adheres to rusted steel, damp or dry, and can be used with any type of finish coating—particularly vinyl resins.	Applied by brushing, spraying, or dipping. It dries hard and can be overcoated.
Cutting Fluid	**Ucon Cutting Fluid H-660**	A synthetic compound that forms a clear solution in water at room temperature. It can be rinsed from metal surfaces with cold water or vaporized in high-temperature, heat-treating operations. Fluid left on parts provides a rust-protective coating.	Used in drilling, grinding, tapping, turning, sawing, milling, punching, and drawing stainless steel, carbon steel, chrome-molybdenum and other alloy steels, aluminum, and phosphor bronze.
Strippable Plastic Finish	**VC-12**	This vinyl finish is available in clear and diluted clear colors and provides protection against corrosion and abrasion. It sets to touch in fifteen minutes and dries hard overnight. This finish may easily be peeled off all non-porous surfaces in sheet-like form.	May be applied by spraying or brushing to all metal or wood surfaces. Uses include the temporary masking of objects during manufacturing operations as in the automobile appliance industries and the lining of paint spray booths in factories.
Vibration-absorbing Material	**Vibraglass**	Made of compressed and bonded glass fibers that will support vibrating loads as great as 2000 pounds per square inch from temperatures of minus 100 degrees F. to plus 375 degrees F. Shows no lateral expansion during compression and recovers immediately after load withdrawal.	Uses to which the material has been put are vibration-absorbing mountings for heavy and light machinery; lightweight shock-absorbing mountings for aircraft computing instruments; and vibration-muffling strips in forced-air furnaces.
Corrosion-resistant Coating	**Vinsynite FS-3**	This vinyl primer when baked as recommended provides a coating which adheres well to ferrous metals and provides resistance to all types of exposure.	Generally used for providing a corrosion resistant coating under top coats. It is usually applied by roller coating.
Corrosion Inhibitor	**VPI 220 VPI 260**	These crystals are slightly volatile at atmospheric temperatures and give off vapors that protect all surfaces of the metal with which the crystals may be packaged.	To prevent corrosion in aircraft engines, precision instruments, tools, and dies.
Stainless Steel	**V2B**	Combines high hardness, non-galling characteristics, and good corrosion resistance. In the quench-annealed state it is readily machinable and may be hardened by a low temperature heat-treatment that produces no distortion. In the annealed condition the material is easily welded, using special welding rods.	Applications include the making of such items as valve discs, plug cocks, shaft sleeves, impellers, pump casings, wearing rings, poppets, conveyor links, rollers, gear blanks, and other parts requiring both wear and corrosion resistance.
Hard-facing Rod	**Wallex**	A rod which resists abrasion, as well as exhibiting impact and corrosion resistance. It is easily welded.	Available in 8- to 12-inch lengths in diameters of 3/16, 1/4, and 5/16 inch. Used for conveyor parts, rolling mill guides, drag-chain idlers, etc.

Names and Addresses of Manufacturers of Products Listed

A3A—Dynakon Corpn., Cleveland 3, Ohio

Ace Drill Rod—Ace Drill Corpn., Adrian, Mich.

Ace Temperon—American Hard Rubber Co., 93 Worth St., New York City

Acme Greaseless Composition—Hanson-Van Winkle-Munning Co., Matawan, N. J.

Actane 33—Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn.

Alcoa C57S; Utilitube; XA54S; and XC56S—Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19, Pa.

Aldip—General Motors Corpn., 1775 Broadway, New York 19, N. Y.

Alhead—Allegheny Ludlum Steel Corpn., Oliver Bldg., Pittsburgh 22, Pa.

Allegheny Ludlum Chromium-Manganese Steel—Allegheny Ludlum Steel Corpn., Oliver Bldg., Pittsburgh 22, Pa.

All-State Nos. 3 and 430—All-State Welding Alloys Co., Inc., White Plains, N. Y.

Aluminum Oxide Compositions—Hanson-Van Winkle-Munning Co., Matawan, N. J.

Alumox 44—Enthone, Inc., 442 Elm St., New Haven 2, Conn.

Anchorite 100—Octagon Process, Inc., 15 Bank St., Staten Island 1, N. Y.

Archer-Daniels-Midland Stripping Oil—Archer-Daniels-Midland Co., 2191 W. 110th St., Cleveland, Ohio

Armor-Tuf—Armor-Tuf Sales Corpn., 299 Madison Ave., New York 17, N. Y.

Armstrong Adhesive A-6—Armstrong Products Co., Box 1, Warsaw, Ind.

Asarcon Alloys—American Smelting & Refining Co., Barber, N. J.

Ateenate—Ateenate, Inc., North Quincy, Mass.

Atlantic Cutting Oils 20 through 45—Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa.

Bearing Blue—Dayton Rogers Mfg. Co., 2828 13th Ave. S., Minneapolis 7, Minn.

Black Magic S.S.—Mitchell-Bradford Chemical Co[illegible] Main St., Stratford, Conn.

Blue Magic Compo[illegible] Nos. 0-221; 1 (Double Strength); C-5; and S-12—Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24, Pa.

Braze-Clad—American Silver Co., 36-07 Prince St., Flushing 54, N. Y.

C-5 Cutting Compound—Felt Products Mfg. Co., 1504 Carroll Ave., Chicago 7, Ill.

Chase Tellurium Copper—Chase Brass & Copper Co., Waterbury 20, Conn.

Chemalloy—Chemalloy Associates, Gillespie Airport, Santee, Calif.

ChemoTec—ChemoTec Div., Eutectic Welding Alloys Corpn., 40-40 172nd St., Flushing, N. Y.

Chromalloying—Chromalloy Corpn., of New York, 109 W. 64th St., New York 23, N.Y.

CM-199—Coast Metals, Inc., Little Ferry, N. J.

Cond-Al—General Electric Co., Schenectady 5, N. Y.

Conflex Copper-Clad Hardenable Steel—Metals & Controls Corpn., General Plate Div., Attleboro, Mass.

Cool-O-Lube—Air Conversion Research Corpn., 4107 N. Damen Ave., Chicago 18, Ill.

Copper-Silver Bronze—Handy & Harman, 82 Fulton St., New York 38, N. Y.

Cor-In—Organic Products Co., Irving, Tex.

Crown Rust Inhibitor—Crown Industrial Products Co., Park and Borden Aves., Sycamore, Ill.

Crucible 422—Crucible Steel Co. of America, 405 Lexington Ave., New York City

Crys-Coat HC—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.

Cupralum—Knapp Mills, Inc., 23-15 Borden Ave., Long Island City, N. Y.

Dayton-Rogers Die Lubricant—Dayton Rogers Mfg. Co., 2828 13th Ave. S., Minneapolis 7, Minn.

Dekoron—Samuel Moore & Co., Mantua, Ohio

Desegatized Steels—Latrobe Steel Co., Latrobe, Pa.

Detrex 61—Detrex Corpn., Box 501, Detroit 32, Mich.

Dip-Pak No. 637—Fidelity Products Corpn., 470-474 Frelinghuysen Ave., Newark, N. J.

Dow Corning 7 Emulsion; Mold Release Emulsion No. 35; and No. 7 Compound—Dow Corning Corpn., Midland, Mich.

Dowmetal AZ91B—Dow Chemical Co., Midland, Mich.

Drawcote—Gilron Products Co., 6007 Euclid Ave., Cleveland 3, Ohio

Dulite 3-0 Black—Du-Lite Chemical Corpn., Middletown, Conn.

Durpon Series—Nopco Chemical Co., 15 Essex St., Harrison, N. J.

Dymo-C—Abrasives Div., Elgin National Watch Co., Elgin, Ill.

Dynakleen—Du-Lite Chemical Corpn., Middletown, Conn.

Dynakon-F and G1A—Dynakon Corpn., Cleveland 3, Ohio

EC-1168—Adhesives & Coatings Div., Minnesota Mining & Mfg. Co., 411 Piquette Ave., Detroit 2, Mich.

Ebonol "C"—Enthone, Inc., Dept. M, 442 Elm St., New Haven 11, Conn.

ElectroShield—American Cladmetals Co., Carnegie, Pa.

Names and Addresses of Manufacturers of Products Listed

Emulsifier STH—General Aniline & Film Corpn., 22 Center Square, Easton, Pa.

Enthone Compound NR-31; Compound 134; Descaler 2A; and Solder Stripper—Enthone, Inc., Dept. M, 442 Elm St., New Haven 7, Conn.

Expamet Expanded Aluminum—British Industries Corpn., 164 Duane St., New York 13, N. Y.

Extrudite—Detrex Corpn., Box 5 1, Detroit 32, Mich.

Ferrolum—Knapp Mills, Inc., 23-15 Borden Ave., Long Island City, N. Y.

Flo—Curran Corpn., Prospect Mills, Lawrence, Mass.

Form-A-Jig—Eutectic Welding Alloys Corpn., 40-40 172nd St., Flushing, N. Y.

Fusion Electro-Tin TE-400—Fusion Engineering, 4504 Superior Ave., Cleveland 3, Ohio

Galvanite—Galvanite Corpn., 40 W. 29th St., New York 1, N. Y.

GE 12353—General Electric Co., Pittsfield, Mass.

G-E Type W-610-A—General Electric Co., Schenectady 5, N. Y.

Grade 608 Chrome Carbide—Carboloy Dept. of General Electric Co., 11147 E. 8 Mile Road, Detroit 32, Mich.

Grade X—Micro Metallic Corpn., 35 Sea Cliff Ave., Glen Cove., N. Y.

Graph-Mo Hollow-Bar—Steel & Tube Div., Timken Roller Bearing Co., Canton 6, Ohio

GRC Rivets—Gries Reproducer Corpn., 780 E. 133rd St., New York 54, N. Y.

Gritcloth—Bay State Abrasives Products Co., 15 Union St. Westboro, Mass.

High-Density Metal—Metal Carbides Corpn., 107 E. Indianola Ave., Youngstown, Ohio.

Hollow-Bar Tool Steel—Crucible Steel Co. of America, Chrysler Bldg., New York 17, N. Y.

Houghto-Clean 439 and 440—E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Hypertap—Destiny Products Co., 2970 W. Grand Blvd., Detroit 2, Mich.

Incoloy—International Nickel Co., 67 Wall St., New York 5, N. Y.

Ion-Kote—DuBois Co., Cincinnati 3, Ohio

J & L "1200" Series—Jones & Laughlin Steel Corpn., Gateway Center, Pittsburgh 30, Pa.

Kanigen—General American Transportation Corpn., 135 LaSalle St., Chicago 90, Ill.

Kelite PWB No. 81 and Kelite Spray White—Kelite Products, Inc., 1250 N. Main St., Los Angeles 12, Calif.

Kemisol A—Wayne Chemical Products Co., Copeland and MCRR, Detroit 17, Mich.

Kentanium—Kennametal, Inc., Latrobe, Pa.

Klem-Kote—Klem Chemicals, Inc., 14401 Lanson Ave., Dearborn, Mich.

Kling-Oil—Magnus Chemical Co., Inc., Garwood, N. J.

Kralastic—United States Rubber Co., Rockefeller Center, New York 20, N. Y.

Kwikflux No. 94—Special Chemicals Corpn., 30 Irving Place, New York 3, N. Y.

Lankote PR-1—J. Landau Co., 221 Wooster St., New York 12, N. Y.

Leaded TS 4140 Modified—La Salle Steel Co., 1412 150th St., Hammond, Ind.

Leafcote—Mid-America Steel Warehouse, 1000 W. 50th St., Chicago, Ill.

Lubri-Cut—Tap & Drill E-Z Corpn., Inglewood, Calif.

Lucoflex—American Lucoflex, Inc., 500 Fifth Ave., New York City

Lukens Copper-Clad Steels—Lukens Steel Co., Coatesville, Pa.

Lustrex 886—Plastics Div., Monsanto Chemical Co., Springfield, Mass.

Magnus 7561; Cutting Compounds Nos. 6, 7, DO-1A, and DO-4A—Magnus Chemical Co., Inc., Garwood, N. J.

Masonite Die Stock—Masonite Corpn., 221 N. LaSalle St., Chicago, Ill.

Master Universal Fillets—Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio

Metalloid X-30—Metalloid Corpn., Huntington, Ind.

Mo-braze—American Electro Metal Corpn., 320 Yonkers Ave., Yonkers 2, N. Y.

Molynamel—Lubricants Div. of the Lockrey Co., Southampton, N. Y.

Mystik Brand Thinflex Masking Tape No. 6207—Mystic Adhesive Products, 2635 N. Kildare Ave., Chicago 39, Ill.

No. 37 Aluminum Solder Rod—All-State Welding Alloys Co., Inc., White Plains, N. Y.

No. 140 Stik-Wax—S. C. Johnson & Son, Inc., Racine, Wis.

No. 1200—American Platinum Works, Newark 5, N. J.

Oakite Composition Nos. 26, 56, 57, 60, 80-A, 95; and Compound No. 31—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.

OK Wear Strips—Ohio Knife Co., Dreman Ave., Cincinnati 23, Ohio.

Parco Black—Parker Rust Proof Co., 2177 E. Milwaukee, Detroit 11, Mich.

Parker Compound 90—Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

PCA-100 and PCA-101—Paint Corporation of America, Fidelity Bldg., Cleveland 14, Ohio

Pelron No. 560—Pelron Corpn., 7740 W. 47th St., Lyons, Ill.

Names and Addresses of Manufacturers of Products Listed

Petrobase 210—Pennsylvania Refining Co., Butler, Pa.

Phenopreg LP-502—Fabricon Products, Inc., River Rouge, Mich.

Phospray—Du-Lite Chemical Corpn., Middletown, Conn.

Polyplastex "MC"—Polyplastex International Corpn., Inc., 441 Madison Ave., New York City

Powdered Stainless Steel—Vanadium-Alloys Steel Co., Latrobe, Pa.

Powrite—Whitfield Chemical Co., Dept. 15-A, 14225 Schaefer Highway, Detroit 27, Mich.

Pydraul F-9—Monsanto Chemical Co., St. Louis 4, Mo.

Quick Pik—Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn.

Quick-Set—Rezolin, Inc., 4825 W. Jefferson Blvd., Los Angeles 16, Calif.

Reynolds Cast-Aluminum Plate and Bar Stock—Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.

Ricwilite 1060 and 7100—Ric-wiL Plastic Coating & Mfg. Corpn., 1290 Euclid Ave., Cleveland 15, Ohio

Rustclean 12 and 15—Octagon Process, Inc., 15 Bank St., Staten Island 1, N. Y.

Rust-Cure—Monroe Co., Inc., 10703 Quebec Ave., Cleveland 6, Ohio

Rustshield 2—Octagon Process, Inc. 15 Bank St., Staten Island 1, N. Y.

Sanco Hammer Finish—Monroe Sander Corpn., 10-18 46th Ave., Long Island City, N. Y.

Seal-All—Allen Products Corpn., 20450 Sherwood Ave., Detroit 34, Mich.

Shear-Speed Soluble Oil—Shear-Speed Chemical Products Div., Michigan Tool Co., 7125 E. McNichols Road, Detroit 12, Mich.

Sheffield Super-Hot — Sheffield Bronze Paint Corpn., 17814 Waterloo Road, Cleveland 19, Ohio

Shell Alvania Grease; Shell Rimula Oil—Shell Oil Co., 50 W. 50th St., New York 20, N. Y.

Simonds Air-Hardening Die Steel—Simonds Saw & Steel Co., Fitchburg, Mass.

Stainless Steel "48" Soldering Flux—Remont Mfg. Co., Lombard, Ill.

Star Etch—Silver Star Chemical Corpn., 58 Watts St., New York 13, N. Y.

Starrett No. 497 Air-Hardening Flat Stock—L. S. Starrett Co., Athol, Mass.

Steel Oilite—Amplex Div., Chrysler Corpn., Detroit 31, Mich.

Steelast—Steelcote Mfg. Co., 3418 Gratiot St., St. Louis, Mo.

Stop-Rust No. O Special—Stop-Rust Co., Chattanooga, Tenn.

Sunep—Sun Oil Co., Philadelphia 3, Pa.

Super La-Led—La Salle Steel Co., 1412 150th St., Hammond, Ind.

Super-Mul—Du Bois Co., Cincinnati 3, Ohio

Super Samson—Carpenter Steel Co., Reading, Pa.

Tarlac—Flash-Stone Co., Inc., 30 E. Rittenhouse St., Philadelphia, Pa.

Ten Series—Forbex Corpn., 125 Broad St., New York 4, N. Y.

Tensilend 100 (Grade 230) and 120 (Grade 260)—Arcos Corpn., Philadelphia 43, Pa.

Thin-Gage High-Nickel Alloys—Industrial Div., American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

Thompson Anti-Spatter: No-Clean (SO-327) and Pickle-Off (SO-317)—Thompson & Co., 1085 Allegheny Ave., Oakmont, Pa.

Tool-Saver—DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

Triple-Chip Soluble Oil—Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio

Tumb-L-Magic—Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N. Y.

Tygorust—U. S. Stoneware Co., Akron, Ohio

Ucon Cutting Fluid H-660—Carbide & Carbon Chemicals Co., Div. of Union Carbide & Carbon Corpn., 30 E. 42nd St., New York 17, N. Y.

VC-12—United Lacquer Mfg. Corpn., 1001 W. Elizabeth Ave., Linden, N. J.

Vibraglass—Glass Fibers Inc., 1810 Madison Ave., Toledo, Ohio

Vinsynite FS-3—Thompson & Co., 1085 Allegheny Ave., Oakmont, Pa.

VPI 220 and 260—Shell Oil Co., 50 W. 50th St., New York 20, N. Y.

V2B—Cooper Alloy Foundry Co., Hillside, N. J.

Wallex—Wall Colmonoy Corpn., 19345 John R St., Detroit, Mich.

Immersion Treatment Developed for Rustproofing Ferrous Metals

A recent development in the war against rust and corrosion is a low-cost chemical immersion method of treating work-pieces made from ferrous metals. This immersion treatment, which is known as "Endurion," was developed in the research laboratory of the Rust-Proofing & Metal Finishing Corporation, Cambridge, Mass. It is claimed that products treated by this method will withstand salt spray tests for unusually long periods of time. The coating can be applied in colors ranging from gray and black through blue, green, and olive drab.

Motion Picture Shows Welding of Stainless Steel

A motion picture entitled "Resistance Welding of Stainless Steel" is now available on a free basis from the Allegheny Ludlum Steel Corporation, 202 Oliver Bldg., Pittsburgh 22, Pa. This 16-millimeter sound and color film describes spot-, seam-, projection-, and butt-welding.

Unique Steel Selection Method Reduces Die Costs

SOUND tool and die engineering is an important factor on any job, especially one involving the production of millions of parts a year. It is doubly important in the manufacture of a competitive item in which sales hinge on the ability to control costs. For this reason, tools and dies should be engineered for specific production requirements.

One concern which has been able to hold production costs in check with no price increase in five years is the Croessant Machine Works, Inc., Reading, Pa., manufacturer of a patented device called the "Molly Screw Anchor" for use in walls. The product is seen in Fig. 1 in progressive stages of manufacture, with the part at the extreme right showing the action of the body when anchored in a wall. This screw anchor posed a complicated tooling problem requiring a variety of tool steels with a wide range of properties for each stage in a series of progressive dies.

From start to finish, a unique Matched Set Method was used for selecting the tool steels best suited to the job requirements. This method—devised by the Carpenter Steel Co., Reading, Pa., and illustrated in Fig. 2—helped reduce trial and error in choosing the steels.

Stations in the progressive sectional die used to pierce, crimp, form, and cut off the anchor body for the fastener are shown in Fig. 3. Coils of dead soft and annealed S A E 1008 cold-rolled steel, 0.035 inch thick, are fed into a 40-ton press which operates at the rate of 104 strokes per minute. The punch and die shown at *A* blanks the slots in the anchor. Although turning out parts in high production quantities, the tools must remain sharp to prevent undesirable burrs. With the die made from a manganese oil-hardening tool steel (Carpenter Stentor), about 30,000 pieces were made before the die required grinding. Then, greater wear resistance being needed, a change was made to an oil-hardening tool steel (Hampden) having a high-carbon, high-chromium content.

Next, to overcome occasional breakage of the thin, unsupported sections of the die, a 5 per cent chromium, air-hardening tool steel (No. 484) was employed to obtain a combination of hardness and toughness. Tools made from this steel are producing a total of about 2,500,000 pieces—approximately 125,000 pieces per grind. The dies are made up of eleven sections, each of which is lapped to a tolerance of 0.0001 inch to insure accurate fit when assembled.

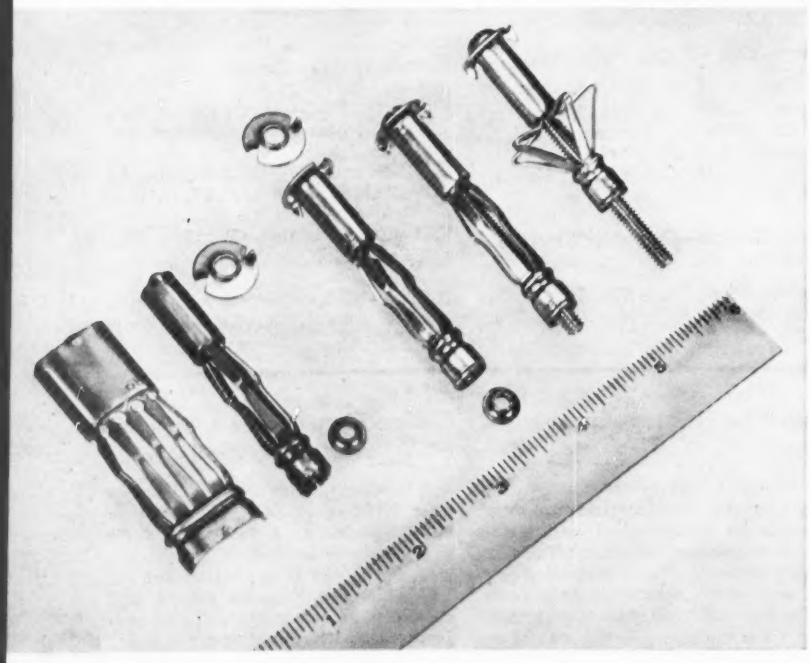


Fig. 1. Progressive stages in the manufacture of a screw anchor. Part at right illustrates action of body when anchored in a wall.



Fig. 2. Matched Set Method for selecting tool and die steels devised by the Carpenter Steel Co. to reduce trial-and-error methods.

A crimping and forming die that is now producing more than 2,000,000 parts is shown at *B*. This die is made from a manganese, chromium, molybdenum air-hardening tool steel (Vega) for maximum toughness. The die shown at *C* forms the part into a U-shape and cuts it from the coil stock. The die member at the left was first made from Stentor steel but, because of occasional chipping of the thin knife edges, it is now made from Vega steel. This grade steel provides the required toughness and maintains accuracy during hardening. The die member at the right was first made of a 1.05 per cent straight-carbon, water-hardening tool steel (No. 11 Special), but was later made from Stentor to eliminate the need for finish-grinding before assembly. With this material, all dimensions of the die can be held within 0.0005 inch per inch.

The forming dies shown in Fig. 4 close the U-shaped fastener body into a tubular shape such as the one seen at the extreme right. The rounded corners at the top of the dies are designed to permit smooth feeding and easy ejection of the parts. These dies require two properties—wear resistance and toughness—and a silicon, molybdenum water-hardening tool steel (Solar) was selected for its high degree of toughness. The wear problem was eliminated by hard chromium-plating the inside surfaces of the dies. The dies are small enough to permit oil-quenching, which,

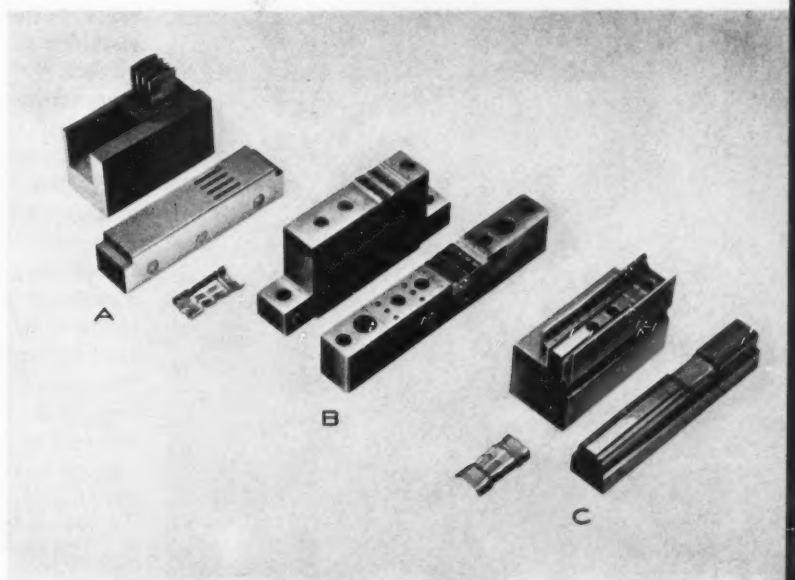


Fig. 3. Stations in progressive sectional die employed to pierce, crimp, form, and cut off body for screw anchor shown in Fig. 1.



Fig. 4. Forming dies at left, for closing U-shaped fastener body into a tubular shape, such as the one seen at right.

in turn, reduces distortion. At present, these dies are producing about 1,000,000 parts. When the chromium wears after this amount of production, the dies are again chromium-plated, with the result that they are then ready to produce another million parts.

The progressive die used to produce caps for the fastener is shown in Fig. 5. Piercing punches *A* are made from a high-carbon, water-hardening tool steel drill rod (Carpenter Green Label), which is heat-treated to obtain a hardness of 62 Rockwell C. About 400,000 parts are produced before the punches require grinding. The same type of drill rod is used for the piercing die inserts *B*.

After trying several steels for the die station shown at *C*, which forms the ears of the cap, Solar was selected. (A close-up view of one of the punches employed at this station of the die is seen at the right in Fig. 6, and a completed cap at the left.) After heat-treatment, this tool is quenched in oil to obtain a hardness of 55 Rockwell C. These punches produce about 400,000 parts before dressing is required, and a total of about 5,000,000 parts before they must be replaced. The production rate is 104 per minute. Other sections of this same progressive die produce about 15,000,000 parts before they must be replaced. A secondary operation achieved at this same station, *C* in Fig. 5, is the formation of a shoulder in the bore of the cap. This is accomplished by means of inserted forming punches made from a high-carbon water-hardening tool steel drill rod heat treated to obtain a hardness of 62 Rockwell C.

For the die at this station, *D* in Fig. 5, Stentor tool steel was originally used, but Vega steel was later substituted to improve the accuracy maintained during hardening, and obtain extra toughness to prevent breakage of the thin sections between the triangular shapes. For this job, the steel is hardened to 58 Rockwell C. For the final blanking operation on the cap, hardened and ground drill rod is used for punches *E*, and No. 484 tool steel for the dies *F*.

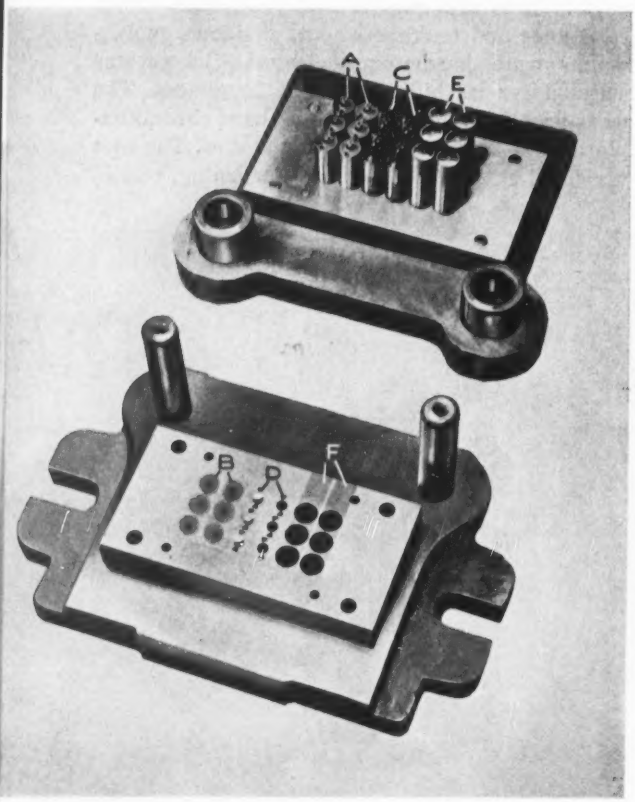


Fig. 5. Caps for the fastener are produced in this progressive die. Piercing punches are seen at (A) and piercing dies at (B).

Fig. 6. Close-up view of one of the punches seen at (C) in Fig. 5. A completed fastener cap is shown at the left of the punch.

Nuts for the fastener are produced on the die seen in Fig. 7. The punches, all made from high-carbon water-hardening drill rod, progressively pierce, form, and blank to produce the finished nuts. Many millions of parts are produced during the life of these tools, which are all hardened to 62 Rockwell C. The die member seen in the lower view was once made from Stentor steel, but was later changed to No. 484 steel, resulting in more than a 50 per cent increase in production.

Careful selection of tool steels in this plant has kept tool and production costs low. With the tool steels now employed, "down" time of the high-speed machines used for this work has not been a problem. As a result, there has been no increase in the price of the screw anchors during the last five years.

* * *

Robot Keeps Constant Watch for Hot Naval Bearings

An automatic electronic temperature-monitoring system designed to eliminate engine shutdowns due to bearing "burn-outs" has been developed for the United States Navy by the Industrial Division of the Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. The heart of the automatic system is an electronic scanning instrument capable of continually checking temperatures in various critical locations.

Thermo-couples, linked to the "scanner," are embedded in forty bearings. The scanner automatically reviews the temperature at all forty points every ten seconds, making six complete checks of each point every minute. When a hot bearing is detected, an alarm sounds and a light glows to alert the attending seaman. A selector switch reveals the exact temperature of the bearing in question so that correction may be made before a dangerous situation is reached.

A prototype of this system is being built for the Bureau of Ships for use on the Navy's 59,000-ton aircraft carrier *U. S. S. Forrestal.*

* * *

A recently developed turbo-jet engine is two and one-half times as powerful as the combined four engines of a World War II heavy bomber. Yet, according to the Aircraft Industries Association of America, Inc., the total weight of the jet engine is less than one of the older bomber's engines and propellers.

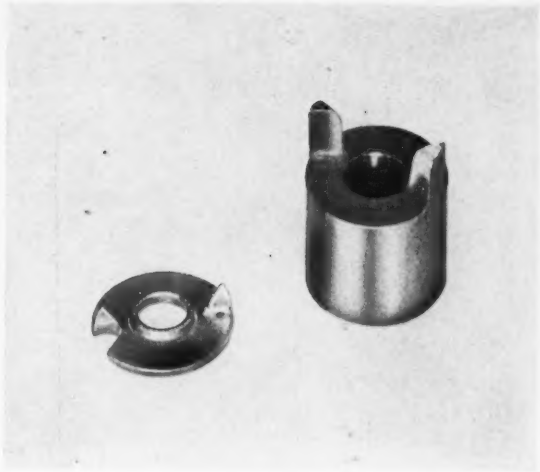
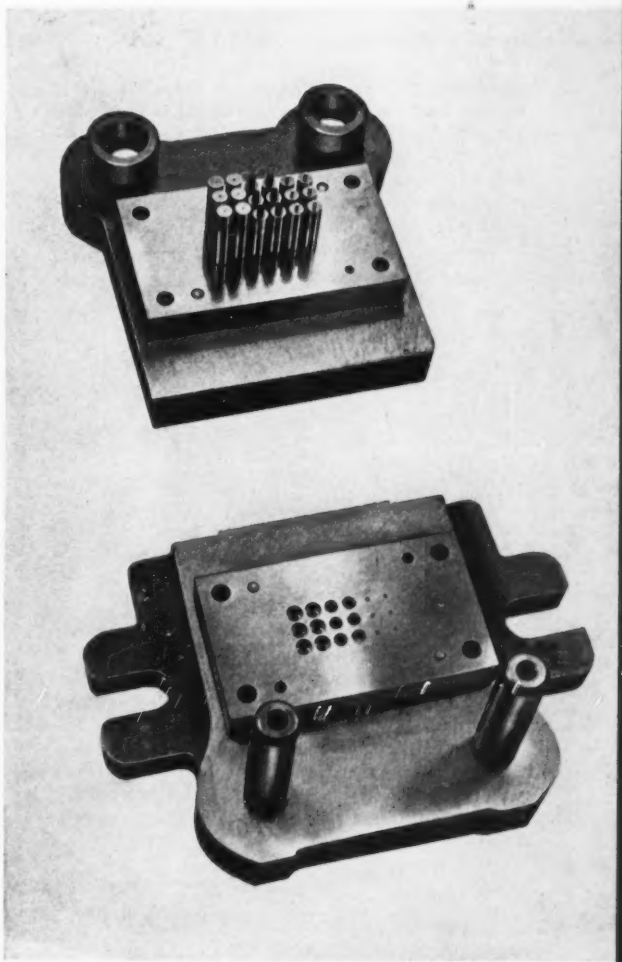
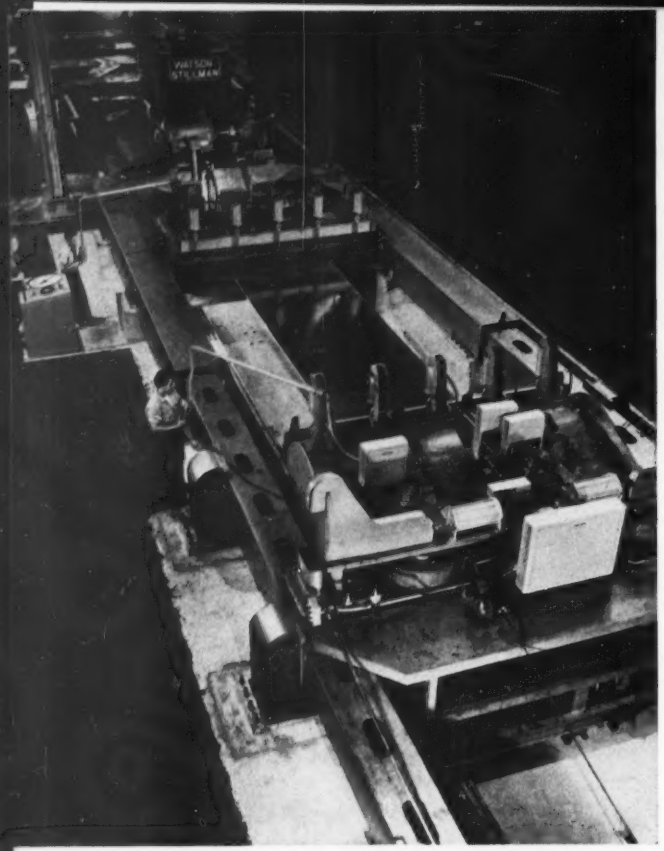


Fig. 7. Die that progressively pierces, forms, and blanks finished nuts for the screw anchor illustrated in Fig. 1.

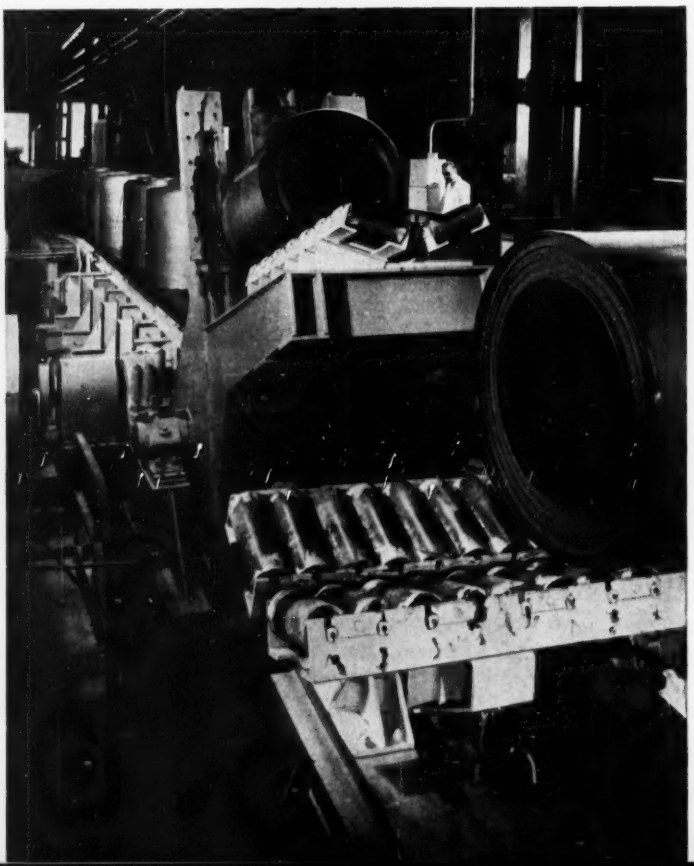


In Shops Around

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

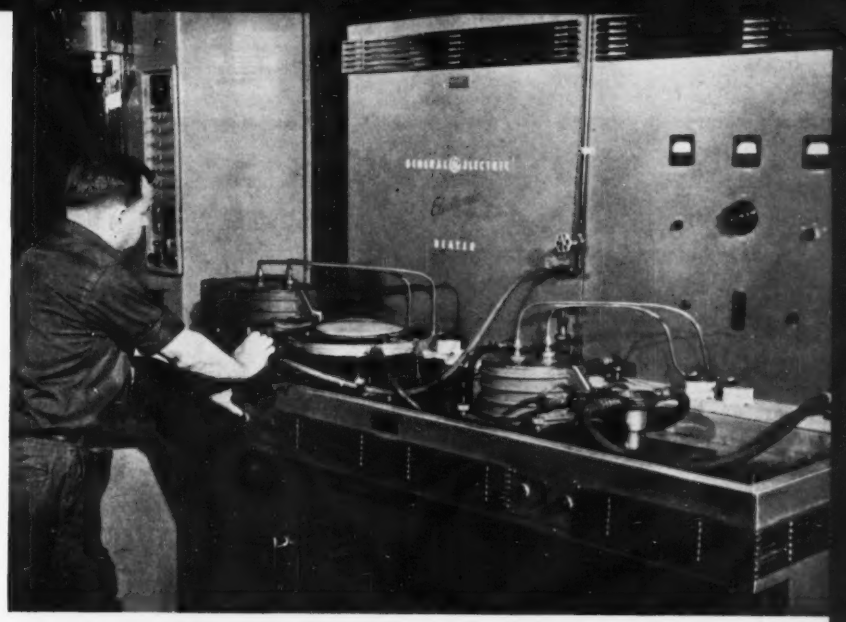


Stretching high-strength aluminum-alloy plate at the Trentwood, Wash., rolling mill of the Kaiser Aluminum & Chemical Corporation. This 5,000,000-pound plate stretcher, weighing 275 tons, is claimed to be the largest and most powerful in the world, having a capacity for handling plates up to 2 inches thick and 40 feet long.

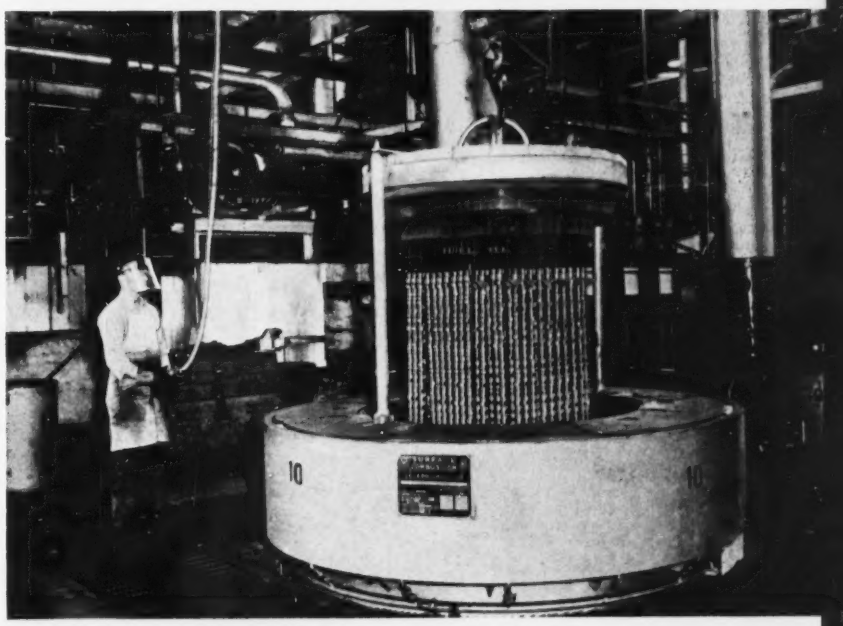


Coils from the delivery end of the hot mill at the Allenport, Pa., plant of the Pittsburgh Steel Co., are being moved slowly away on conveyors. After being coiled at temperatures that are maintained low enough to prevent grain growth, the steel is gradually cooled to atmospheric temperature.

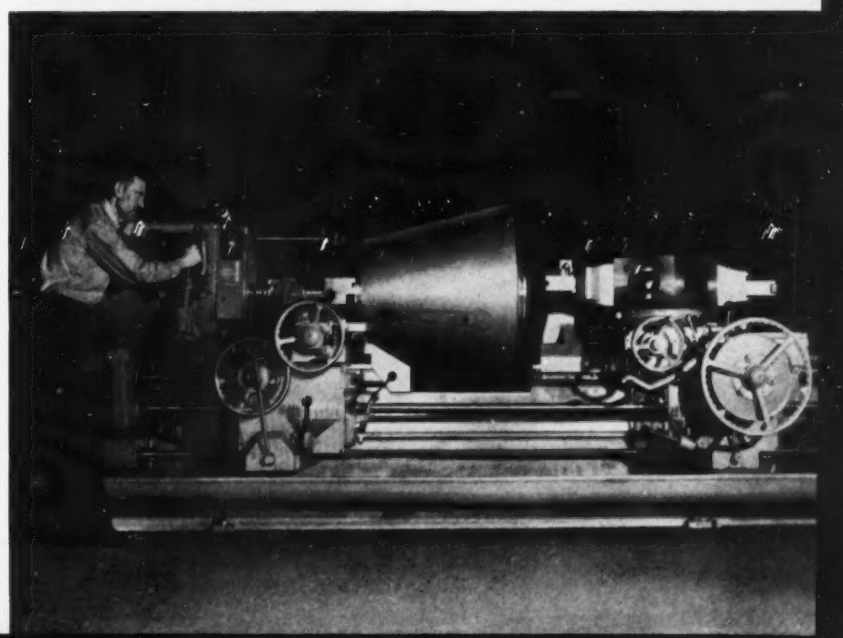
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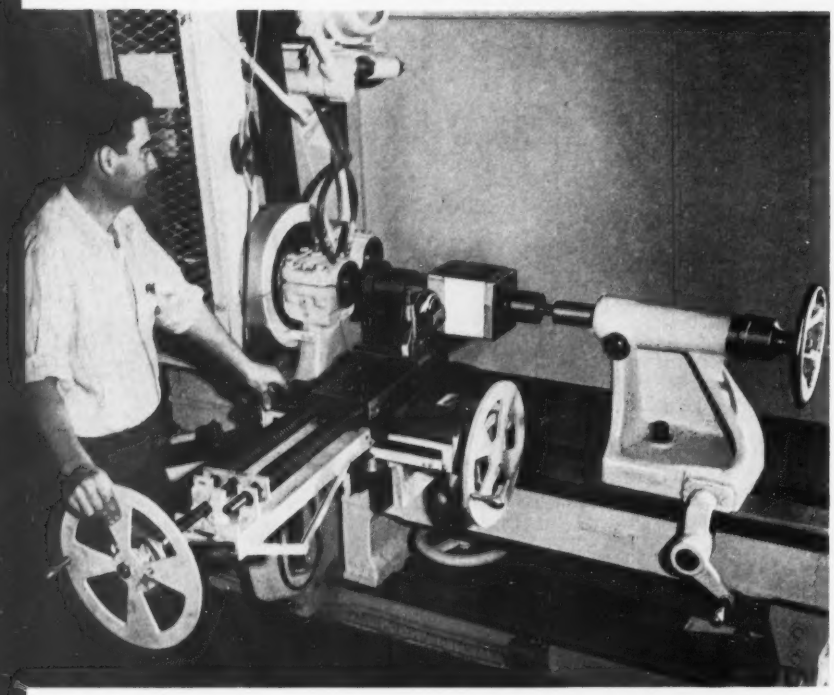
Hardening of textile machinery parts has been stepped up at the Whitin Machine Works, Whitinsville, Mass., by the use of a General Electric 50-K.W. electronic induction heater. A unique feature—an electric transfer switch—allows one part to be set up while another part goes through the hardening cycle. Although used mainly for hardening, it is also used for annealing and soldering.



Charging a Surface Combustion pit type carburizing furnace with 4800 pounds of automotive camshafts at the Buick Division of General Motors Corporation, Flint, Mich. Radiant tubes and a recirculating fan produce maximum carburizing atmosphere circulation through the closely packed charge at temperatures up to 1700 degrees F. A specially prepared gas atmosphere is used as the carburizing medium.



Fabricating large jet-engine exhaust cover on the first of six new Warner & Swasey gap lathes built for the Ryan Aeronautical Co., San Diego, Calif. The gap, together with special tools and tool-holders, permits the machining of the cover at both ends in a single set-up. Among the special features are a one-piece, welded-steel foundation and a hydraulic spindle brake.



Spinning Aircraft

Sheet-metal aircraft parts of square, rectangular, octagonal, or eccentric shape can be rapidly spun at low cost on a modified metal-spinning lathe

By J. Stanley Walker
General Foreman, Special Projects
Boeing Airplane Co.,
Seattle, Wash.

SPINNING, an ancient art of sheet-metal forming that is known to have been practiced by the early Egyptians, has always been considered to be limited to the production of symmetrical articles that are circular in cross-section normal to the axis of rotation. But now, sheet-metal aircraft parts of square, rectangular, octagonal, or eccentric shape are rapidly spun at low cost on a modified metal-spinning lathe developed at the Boeing Airplane Co.

The cross-slide of the modified spinning lathe, shown in the heading illustration, is equipped with two coil springs which apply adjustable pressure upon a roller. The metal to be formed is held on a spinning block of the required shape; as the block and metal rotate, the spring-loaded roller forms the metal to the shape of the block.

A few of the many different, eccentric-shaped aircraft parts that have been spun with this set-up are shown in Fig. 1. Although parts of such shape are generally drawn in presses, the relatively small quantity of each part required in experimental aircraft production would make the cost of press dies prohibitive. A spinning block can be made much more rapidly and at a fraction of the cost of a press die.

Aluminum-alloy sheets up to 0.125 inch thick, SAE 1020 steel sheets up to 0.060 inch thick, and stainless-steel sheet up to 0.050 inch thick are among the materials that have been spun in this way. Though parts spun to date have not been larger than approximately 12 inches in diameter, there is no reason why much larger



Fig. 1. Samples of eccentric-shaped aircraft parts that have been formed on the modified spinning lathe shown in the heading illustration

Non-Circular Components

components cannot be formed on the same lathe. Spinning blocks, such as the two shown at the bottom in Fig. 2, can be made from hard wood, Masonite, Micarta, or other suitable material. External dimensions of the block are made the same as the internal dimensions of the part to be formed. The block is mounted on the headstock of the spinning lathe and supported by the tailstock center.

Flat discs of the material to be formed are first drawn or spun by conventional means into a cup having a diameter approximately equal to that of the required part. The pre-shaped cup is then slipped over the spinning block, tightly enough so that it binds in several places. When the loaded block has been placed in the lathe, the roller is brought into contact with the metal to be formed, and the work-piece is slowly rotated (at 10 to 20 R.P.M.). Most shapes can be formed with one pass of the roller, but smoother finishes can be obtained by passing the roller over the work two or more times.

The roller is free to rotate in a special holder secured in the toolpost of the lathe, Fig. 3. The shaft on which the roller is mounted rotates in anti-friction bearings pressed into the holder. A crowned cylindrical roller is shown, but some of the rollers employed have straight peripheries. The rollers are made from steel, Micarta, or other material.



Fig. 2. Spinning blocks (bottom) and spun parts (top). The blocks are made from hard wood, Masonite, Micarta, or other suitable material.

The two coil compression springs, which maintain pressure on the roller and thus form the metal to the shape of the spinning block, are made from 3/16-inch diameter wire, coiled to fit over 7/8-inch diameter rods. The springs have an expanded length of 18 inches, with an unloaded lead or pitch of 3/8 inch, and are held on the rods by two end plates mounted on the compound rest of the lathe.

The front plate can be moved toward or away from the roller by turning a handwheel (seen at

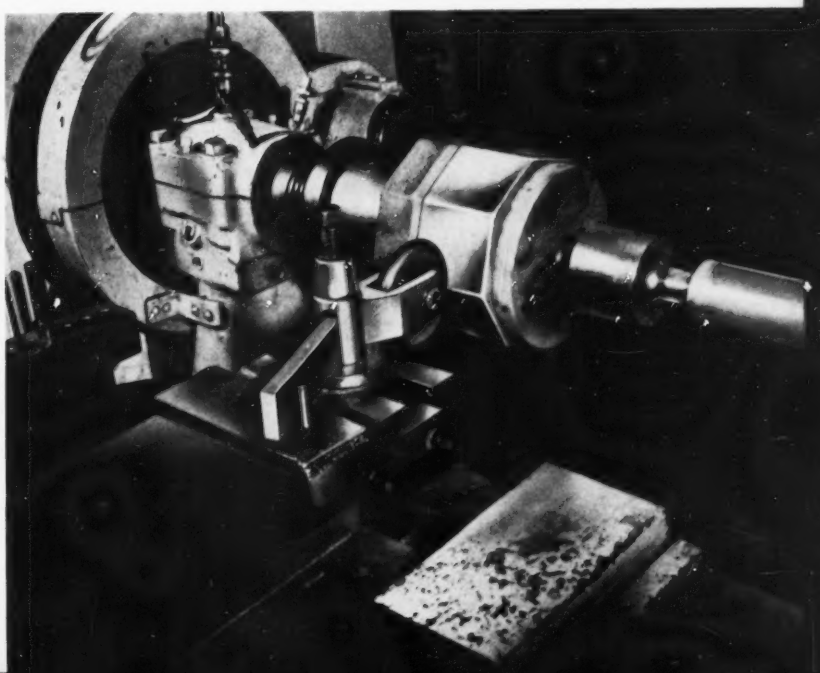


Fig. 3. Crowned cylindrical idler roll, free to rotate in a special holder secured in toolpost of spinning lathe, exerts pressure on work-piece.

the lower left in the heading illustration) connected to a transverse screw, thus compressing or expanding the springs to increase or decrease the pressure with which the roller forces the metal into contact with the spinning block. The springs are generally compressed from 6 to 12 inches for spinning various parts. The handwheel seen at the right of the compound rest is attached to another screw, and is used to move the roller longitudinally, parallel to the center line of the lathe and the work-piece mounted on the spinning block.

Carbides Machine Tough Oil-Country Equipment

INCREASED production and longer tool life, together with greatly stepped-up speeds, are being realized by the Byron Jackson Co., Los Angeles, Calif., through a tool change-over from high-speed steel to cemented tungsten carbide. This oil-field equipment producer now obtains a tenfold increase in cutter life in the milling operation shown in Fig. 1. The work-piece is a forging of chromium-molybdenum steel, used for the shank of a 300-ton oil-well drill pipe hook. A Cincinnati Hydromatic bed type machine face-mills two parallel flats, 9 inches wide by 45 inches long and 3/4 inch deep.

Because of the toughness of the forging and its thick surface scale, previously used high-speed steel cutters were run at only 30 surface feet per minute with a 3/4-inch per minute feed. Cutters had to be reground after each pass. Today, 10-inch face milling cutters equipped with blades of Kennametal K2S carbide run at 250 surface feet per minute with a 6-inch per minute feed. Depth of cut averages between 5/16 and 1/2 inch per pass. There are ten cutter blades, each carrying a chip load of 0.0063 inch. More than ten passes can be made before regrinding.

Turning the same forging, Fig. 2, involves an interrupted cut. Production on the 30-inch Axelson lathe used was quadrupled with a standard Kennametal KM carbide brazed tool set up on its side. The 12-inch diameter forging, 53 inches long, is turned to an outside diameter of 10 1/2 inches, then necked near the chucked end to a 4 1/2-inch diameter. The 1/32 inch of scale and the 1/2 to 3/4 inch depth of stock, together with the severe interrupted cut over the flats, make turning difficult.

With but a slight modification, the tool was adapted to operate at a shear angle. First, the original 15-degree lead angle was increased to 17 degrees to remove the point radius, and a new radius was ground along the width of the blank. Then, the tool was set in a toolpost on its side to give a 17-degree negative back rake and a 7-degree positive side rake. A 10-degree lead angle was obtained by adjusting the toolpost an appropriate amount.

The tool runs at 207 surface feet per minute with a 0.033-inch feed per revolution. Four shanks are completed in approximately the same time as was previously required to finish one shank when a high-speed steel tool, running at 30 surface feet per minute with a 0.050-inch feed was used. The depth of cut with the carbide tool averages between 3/8 and 7/8 inch.



Fig. 1. Face-milling the shank of an oil-well drill pipe hook with a carbide cutter

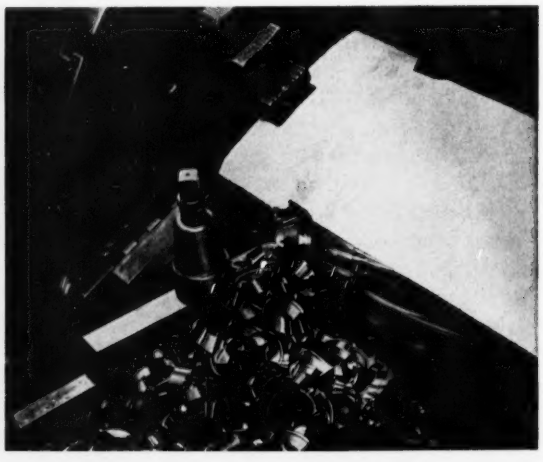


Fig. 2. Setting the tool on its side provides a shear angle that is ideal for an interrupted cut.

How Form Tolerances Affect Gaging Requirements

Part I

Tolerances are established to control variations in size, form, position, and function. In this fifth of a series of articles on dimensions and tolerances for mass production, the author shows how tolerances on form—particularly profiles—are selected and how they determine the gaging requirements

By EARLE BUCKINGHAM
Professor of Mechanical Engineering
Massachusetts Institute of Technology

THE present methods of expressing tolerances on conditions of *form* are far from adequate. In most cases, no tolerances are given except for one or two of the dimensions which can be measured most easily. The tolerances that are expressed are often ambiguous in their application, inconsistent with each other, and lead to many disputes as to their correct interpretation. Where tolerances have been applied to conditions of form, they usually have been expressed without any attempt to follow through all of their implications and seldom has the attempt been made to translate them into effective inspection gages. At times, these tolerances appear to have been given with the idea of indicating the relative importance (or unimportance) of certain features, without any intention of ever checking them for their conformity to the expressed tolerances. Here again, it should be emphasized, that no tolerances should ever be given unless they are to be actually used and checked.

Factors to be Considered—The forms met in design are many and various. Some are of extreme importance to the correct functioning of the product, such as the forms of cams, gear teeth, tapers, and the like, while others have little or no functional importance. Many of these last are "atmospheric fits" such as the forms of knobs and machine handles. Yet even for forms in this category, when parts are made in quantity, over and over again, some limits to the permissible variations must be specified—*and measured*—if any control is to be maintained.

To complicate a complex problem still further, many of the most important of the functional forms are also inextricably tied in with conditions of position. Here, it is often the combined error of form and position which must be held to prescribed tolerances if correct functioning of the product is to be attained. Functional gages

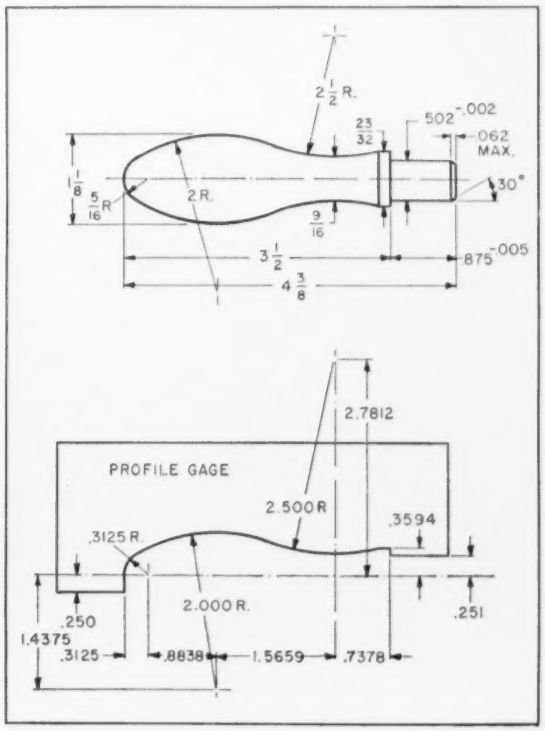


Fig. 1. The contour of this machine handle was formerly checked by using the template, or profile, gage shown. Since no definite tolerance was specified on the form of the handle, the use of this gage resulted in disputes over whether or not design specifications had been met.

are needed to check such combined conditions. Even so, the production department must be able to check the conditions of form and position independently in order to make any needed corrections to the tools or set-up required to meet the combined conditions with certainty.

No simple general rule has yet been formulated which is adequate to meet all of the many different kinds of conditions. Possibly no manual or treatise will ever be so complete that it will cover all eventualities. Unusual cases will develop in unexpected places. These challenge the designer to express the actual requirements in terms of the inspection gages so that these requirements can be inspected definitely and without difficulty.

An effort is here made to establish an orderly approach to this problem by treating individually several of the different types of form or profile dimensional problems. This is best done by a series of specific examples.

Non-Functional (Non-Critical) Forms

Machine Handle—The first example is the machine handle shown in Fig. 1. The formed handle itself does not fit any other part of the product. It is an "atmospheric fit." The cylindrical shank shown at the right-hand end on the drawing fits a hole in the handwheel and this feature involves conditions of size only. This last-mentioned feature is dimensioned and inspected as a condition of size in the manner previously outlined.

Limitations of Checking with Template—In the past, if tolerances were applied to any element of the handle form or profile seen in Fig. 1, they would be applied to one or more of the three diameters indicated, and then treated as conditions of size. If any gage were provided for the form, it would be a profile gage as illustrated in Fig. 1. This formed template is held against the work, the form of which is then supposed to match the form of the template. With no definite tolerances expressed and with a large volume of production, sooner or later arguments arise in the shop between the operator and the inspector as to whether or not some particular lot of these machine handles really meets the specifications. Any action that will eliminate or minimize such disputes is well worthwhile. In this case, the trouble is that the dimensional specifications are not definite and precise, and cannot be translated directly into a set of limit gage inspection requirements.

For profiles of this type, a tolerance on the form can be introduced simply and gaged definitely as a metal tolerance on the surface in question. Such a metal tolerance is measured normally to the design profile. A plus tolerance means that more metal can be left on the product than that specified by the design sizes, and a minus tolerance means that less metal than specified can be left. A plus and minus tolerance permits more or less metal. This practice is given in the S A E Automotive Drafting Standards.

All of the dimensions which are needed to establish the design profile are constructional dimensions and carry no tolerances directly on them. The tolerance band established by the metal tolerance follows the design profile and

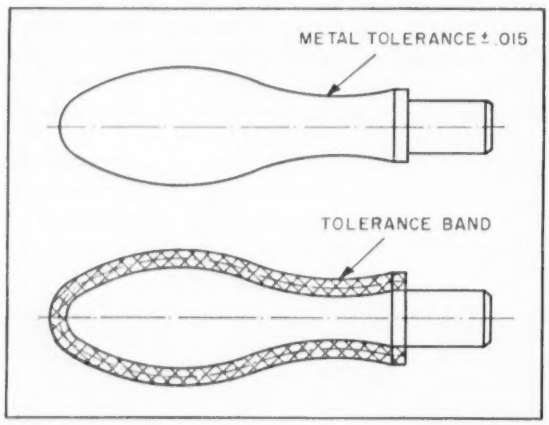


Fig. 2. (Above) A tolerance on the contour of the machine handle seen in Fig. 1 could be introduced simply as a metal tolerance, as shown here. This would permit the use of a definite method of gaging the profile.

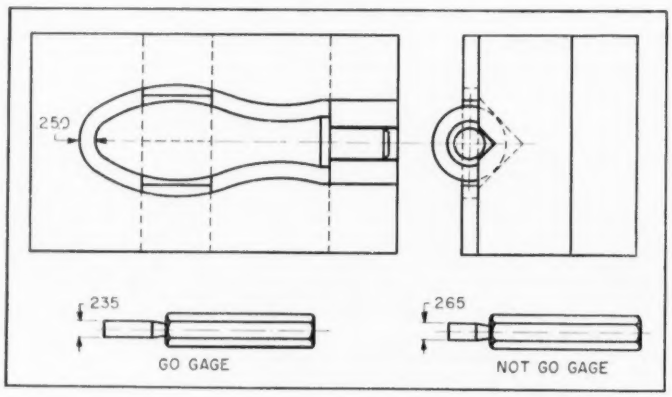


Fig. 3. (Right) The use of GO and NOT GO plugs in conjunction with a master profile makes it easy to check the tolerance band specified in Fig. 2.

has a width equal to the total metal tolerance. It is expressed on the drawing by the notation: *METAL TOL.* ±*.015*, if this variation can be that amount in either direction. This is shown in Fig. 2. The cross-hatched area there indicates the limits of the tolerance band for the specified conditions.

Use of Profile Limit Gage—One type of a profile limit gage that might be used is shown in Fig. 3. A template is made with its profile a fixed amount larger than the design profile—say 0.250 inch larger. This template is mounted on a base with two V-blocks to hold the machine handle in position in relation to the template. The handle may be clamped there, or it may be held by one hand while the limit plug gages are used in turn by the other hand. The shank and its shoulder locate the machine handle in relation to the template. The GO gage which defines the maximum metal limit size must pass without forcing around the entire profile between the machine handle and the template. This gage is made 0.235 inch in diameter or 0.015 inch smaller in diameter than the nominal width of the space. The NOT GO gage which checks the minimum metal limit size must not enter between the machine handle and the template at any point. This gage is made 0.265 inch in diameter or 0.015 inch larger in diameter than the nominal space width. In this manner, the width of the tolerance band around the entire profile of the machine handle is measured. The test plugs are also shown in Fig. 3.

Another type of profile limit gage uses a master profile of the size and form of the design profile with a dial indicator gage mounted on a special try-square or block. Such a gage is illustrated in Fig. 4. The radius or contour of the edge of the square is substantially the same as that of the indicator point of the dial indicator gage, as can be seen in the top view of Fig. 4. This try-square unit is held against an angle-plate and the dial is set to zero. The angle-plate is removed and the master profile mounted on a surface plate at the correct height to engage the indicator point of the dial indicator gage. Suitable locating and clamping means are provided to hold the machine handle in the proper position above the master profile.

In the gaging operation, the machine handle is clamped in position over the master template. The special try-square or block with the dial indicator gage is then brought into position with the indicator point in contact with the master template, and the edge of the straightedge of the try-square in contact with the machine handle. As this try-square with the dial indicator gage is moved around the contour of the machine handle, the hand of the dial indicator registers the amount of variation in size normal to the design profile. This amount must not exceed the amount of the prescribed tolerance.

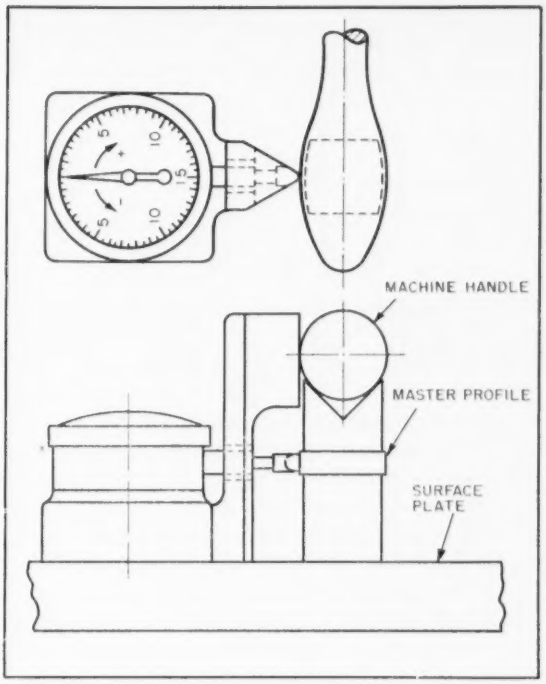
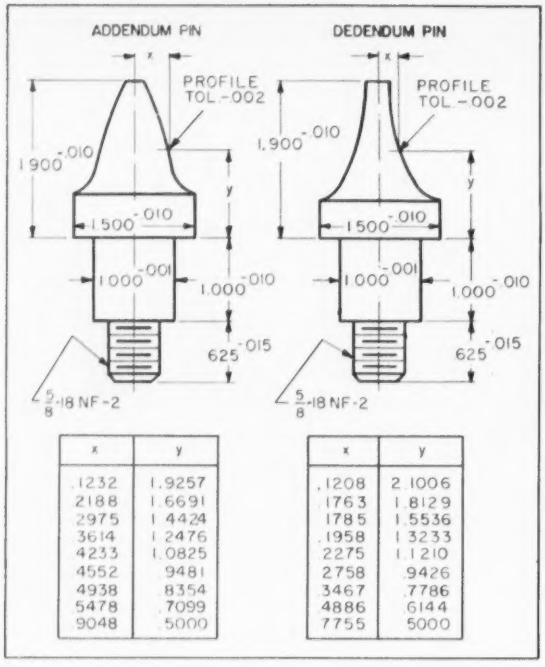


Fig. 4. Instead of the method indicated in Fig. 3, a master profile and a dial indicator gage may be used to check the profile of the machine handle.

Use of Optical Comparator—Another type of profile measuring equipment consists of an optical comparator which throws an enlarged shadow of the form of a part on a screen where it is compared with an enlarged outline of the design profile. When metal tolerances are given, a double outline representing the tolerance band is drawn on the screen. In this case, the shadow of the product must lie completely within this enlarged tolerance band.

Functional (Critical) Forms

Any of the foregoing profile testing methods can also be applied when *both* the sizes and the forms are critical functional elements. As an example, Fig. 5 shows two formed pins, one for the addendum and the other for the dedendum. Pins of these two forms are assembled to make up a pin-tooth face gear which meshes with what is known as a lantern pinion. The forms of these pins are conjugate gear-tooth forms and their accuracy of size and form is essential to the smoothness of action of this drive. In this exam-



x	y
.1232	1.9257
.2188	1.6691
.2975	1.4424
.3614	1.2476
.4233	1.0825
.4552	.9481
.4938	.8354
.5478	.7099
.9048	.5000

x	y
.1208	2.1006
.1763	1.8129
.1785	1.5536
.1958	1.3233
.2275	1.1210
.2758	.9426
.3467	.7786
.4886	.6144
.7755	.5000

Fig. 5. The profiles of these pins for a thirty-six-tooth pin-tooth face gear are specified by a series of Cartesian coordinates for points on the profiles.

ple, the metal tolerance is minus 0.002 inch, and the position of the form in relation to the shoulder is also important.

The forms of the profiles of these pins are specified by a series of values of the Cartesian coordinates for points on the profiles, the x values being measured from the axis of the pins and the y values being measured up from the shoulders as indicated in Fig. 5.

Use of Master Profiles—Master profiles are made by accurately plotting these coordinates. These master profiles are checked optically against enlarged lay-outs of the values on the screen of an optical comparator. The form tools for turning each of these pins are fitted to the respective master profiles.

The same master profiles may also be assembled on two surface-plate dial indicator types of gages. A block is mounted on the surface plate with a hole to receive the shank of the formed pins. The master profile is mounted below the pin and in its proper relative position to it. The gage for the addendum pin is shown in Fig. 6. The construction of the gage for the dedendum pin is the same. The operation of the indicator try-square on this gage is the same as on the gage for the machine handle. In this case, the dial indicator gage used should be one that indicates 0.0001 inch for each division on the dial.

Where Form Tolerances are Less than Size Tolerances—The metal tolerance at any point on a contour is always measured along a line normal to the contour. When this normal is at right angles to the axis of the component, the metal tolerance is also the radial tolerance at that particular diameter. In some cases (such as for most cams), the *size* of the general form may be permitted to vary a greater amount than can be allowed on the *form*, itself.

To take a simpler example, the diameter of a high-speed shaft may be permitted to vary, say, 0.0003 inch, but it must not be out-of-round more than, say, 0.0002 inch. As still another example, the form of the cam may be that of an eccentric circle which must have an accurate lift or throw in half a revolution, but the diameter of the circle or cam form can be allowed to vary a much greater amount. Such a condition exists for the cam forms on the camshaft of an internal combustion engine. In all such cases, a size tolerance must be specified as such, together with a more restrictive profile or cam-action tolerance. The conditions of size are inspected by suitable limit gages, while the profile or cam action is

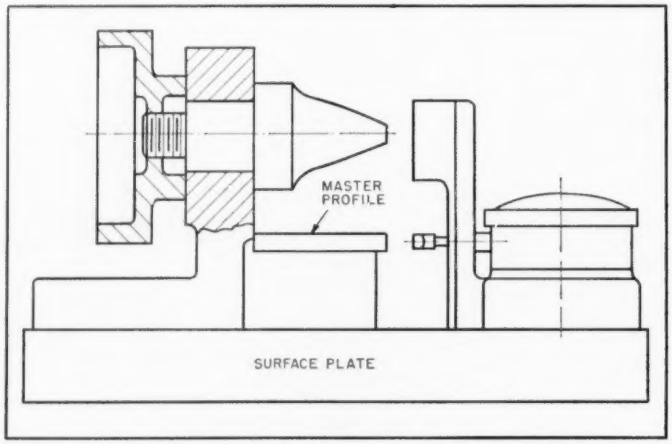


Fig. 6. The addendum pin shown in Fig. 5 is checked by using a master profile and dial indicator gage set-up similar to that used to check the machine handle.

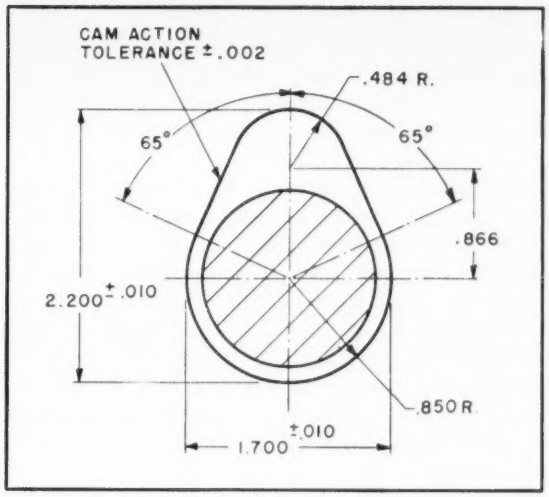


Fig. 7. In the case of this valve lift cam, the permissible variation in the size of the general form is greater than the permissible variation in the form itself. The size tolerances are ±0.010 inch, whereas the form or cam action tolerance is only ±0.002 inch.

inspected by a dial indicator gage which measures the departure from the design action independently of the conditions of size.

Checking Tolerances on Cam Forms—The form of the profile of some cams is specified in terms of the form of the path followed by the center of the roll follower. In such cases, the comparator used for inspection must also employ a roll follower of the prescribed size. In other cases, where the form is simple, the profile of the cam surface itself is given directly.

In the case of the camshaft for an internal combustion engine, adjustment is provided in the design of the engine to control the amount of opening of the valves so that the actual size of the cam can vary considerably while the amount of lift of the cam must be held to much smaller variations. The form of such a cam is shown in Fig. 7. Tolerances on conditions of size are given for the smallest and largest over-all dimensions of the cam. The tolerance on the cam action itself is given separately by the notation: *CAM ACTION TOL.* ±.002.

Construction of Special Comparator—The conditions of size are inspected with the aid of limit snap gages. The action of the cam is inspected on a special comparator, as shown in Fig. 8. This comparator consists of a frame on which is mounted a master camshaft together with means for mounting and positioning the camshaft which is to be inspected. The two camshafts are held in correct angular relationship to each other by means of the keyway which positions the key for the timing gear. This gear is mounted on the end of the camshaft to drive it in the assembled engine. The two camshafts are revolved in timed relationship to each other by means of a worm-gear or spiral-gear drive mounted on each camshaft and with the driving members for both shafts mounted on the same shaft.

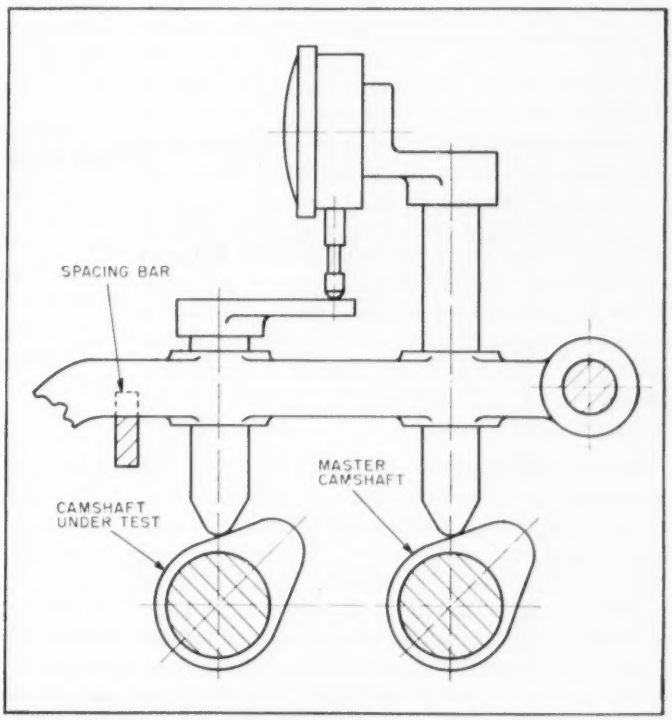


Fig. 8. This comparator type of gage is employed to check the action of the cam shown in Fig. 7 by comparing its cam action at various angular positions with a master cam.

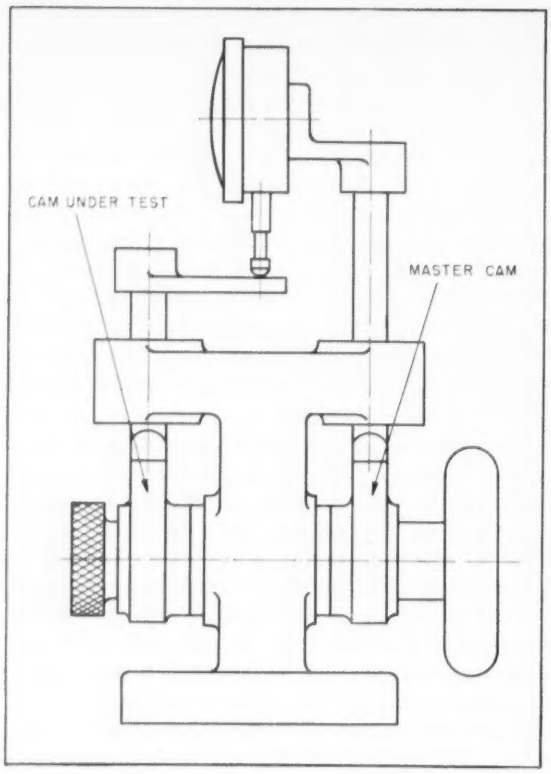


Fig. 9. If a single cam is to be checked for cam action, this simplified version of the comparator shown in Fig. 8 may be used.

A carriage that carries two replicas of the cam follower, each of which is free to slide in a vertical direction, is mounted on a horizontal shaft at the rear of the frame. It rests on a notched bar at the front which supports the carriage in its correct position in relation to each successive cam element. The carriage is moved from one cam to another until all of the several cams on the camshaft have been inspected. The notches in the front bar align the cam followers for each pair of cams. A dial indicator gage is attached to the top of the cam follower that acts against the master cam and its indicating element makes contact with the top of an offset arm on the cam follower that acts against the surface of the camshaft under test.

Errors Indicated by Comparator—The two camshafts are revolved slowly, either by hand or by means of a small electric motor which drives through a round leather belt on a grooved pulley. The belt is adjusted until it is just tight enough to drive the unit. A sufficiently large handwheel is attached to the outer end of the driving shaft so that the rotation of the camshafts can be stopped at any time by holding this handwheel and allowing the round leather belt to slip on its grooved pulley. When the cam action is the same on both camshafts, the hand on the face of the dial indicator gage remains stationary. Any error in action is measured by the amount of hand movement.

This comparator also tells whether the relative angular positions of the cams along the camshaft are or are not correct. When angular errors are present, they are most evident when the followers are at the top of the lift. At this point there is a sudden drop and rise, or flicker, of the hand on the face of the dial indicator gage if such angular errors are present. The amount of movement of the hand can be calibrated to indicate the amount of this error in the relative angular position.

Comparator for Single Cam—When the inspection of a single cam is involved, a similar but much simpler comparator can be designed. In this case, both cams are mounted on a single shaft, as shown in Fig. 9, with the two cam followers and the dial indicator gage acting as before. Here a simple handwheel may be adequate as a means of rotating the shaft. A master cam is permanently mounted on the common shaft, and the cam to be inspected is mounted on its open end in its correct angular position. This position is usually controlled by the position of the keyway in the cam. Otherwise the two cams must be aligned to some prominent point on the cam form itself. The further operation of the inspection is the same as before. The movement of the hand on the face of the dial indicator gage measures the error in the action of the cam under test relative to the master cam.

Involute Form Comparator—A similar problem is met when the errors in some mathematical curves are to be measured, such as the accuracy of the involute curve on a gear tooth. Here, the mathematical form may be developed mechanically, often by using the position of the end of the measuring element of some indicating device which is constrained to follow the required mathematical curve. As an example, there is the construction shown in Fig. 10 for the involute curve.

The involute of a circle is the form that is described by the end of a string as it is unwound from the circumference of a cylinder. This is the most commonly used form for the teeth of spur and helical gears. The accuracy of the form required is generally specified as the permissible departure from the true form, and sometimes the range of the angle of roll from its origin at the base circle (cylinder) within which the form is to be measured is specified also. Such an angle

of roll is also its angle of rotation as a gear tooth. The allowable errors are generally very small and are measured in tenths of thousandths of an inch. One notation that may be used for this is as follows: *ERROR IN INVOLUTE NOT OVER* 0.0003 inch.

Referring again to Fig. 10, the general construction of this involute testing equipment is as follows: A heavy flywheel is mounted on the shaft that carries two base cylinders of the size of the base circle of the involute gear, and also the gear itself which is to be tested. This flywheel is graduated at its rim so as to measure the angle of roll when necessary. These graduations will register with a straightedge positioned on the center line of the shaft and flywheel, as can be seen in the illustration.

In operation, the two base cylinders roll along the two flat horizontal ways. The weight of the flywheel creates enough traction so that these two base cylinders roll without slipping. Stops are provided at the ends of the ways to square up the rolls in correct position and to establish the zero angle of roll. The indicator point on the lever which actuates the dial indicator gage or other indicator device that may be used is accurately located on the line of the ways so as to be tangent to the base cylinder. This indicator point bears against the gear tooth to be tested as shown in Fig. 10.

For the inspection, the gear to be tested is mounted on the open end of the shaft. This shaft assembly is adjusted to its starting position and is then rolled slowly along the horizontal ways. If the form of the involute tooth is correct, the indicator hand remains stationary. If errors are present, the indicator hand shows their nature and amount. Sometimes a record is made of the indicator reading for each angle of roll and the results are tabulated or plotted on a suitable form. Some involute measuring devices have an automatic recorder which draws a line that records the nature, amount, and position of all errors in form.

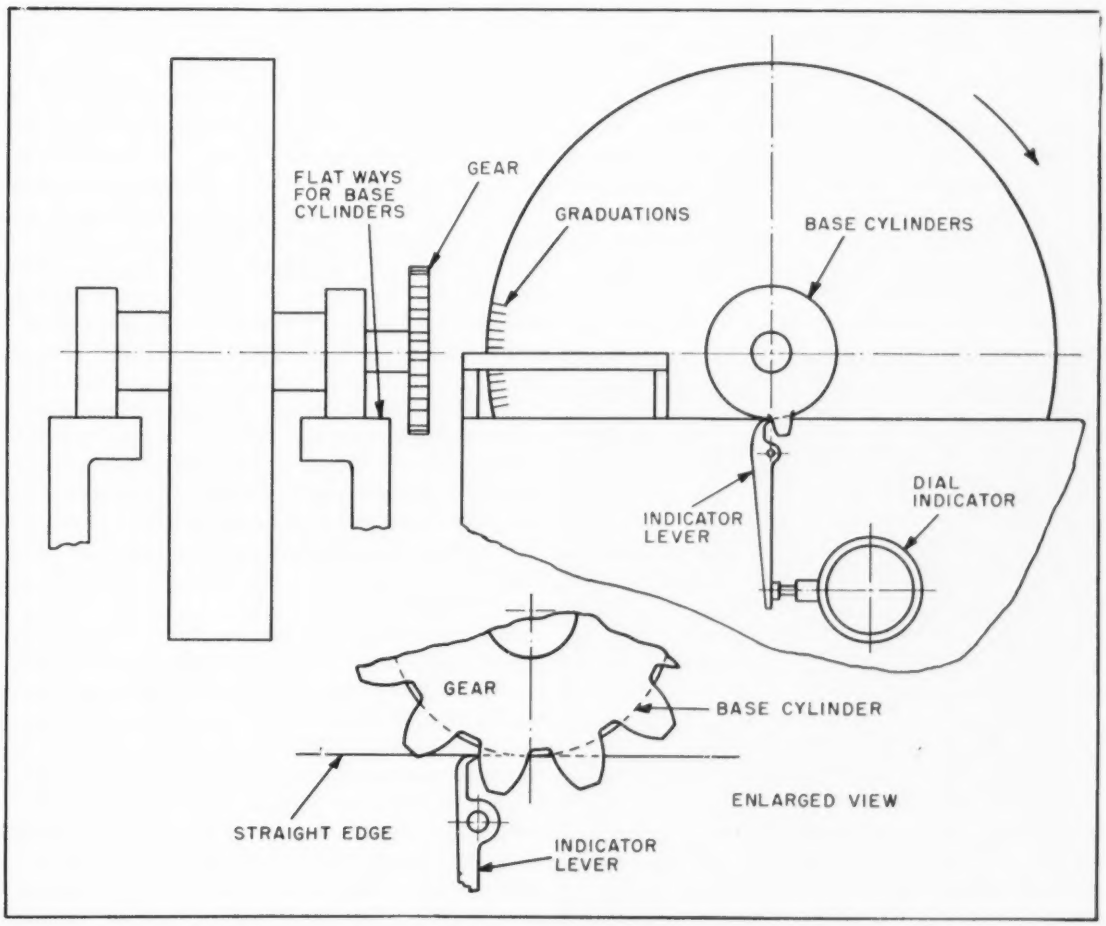


Fig. 10. Where mathematical curves are to be checked, as in the case of the involute profiles of gears, the profile testing device may consist simply of an indicating mechanism constrained to follow a mechanical development of the curve.

Metal Show to be Held in Cleveland

WITH the selection of "Metals Market Place of the World" as the theme, the thirty-fifth National Metal Congress and Exposition will be held in Cleveland, Ohio, October 17 to 23, inclusive. Over 400 firms engaged in the production, treatment, or fabrication of metals will utilize 210,000 square feet of floor space in the Cleveland Public Auditorium to display and demonstrate their products, equipment, or services, the Exposition itself beginning Monday, October 19.

Technical meetings of the four sponsoring societies will be held in various Cleveland hotels. The American Society for Metals will meet in the Hotel Statler; the American Welding Society in the Hotel Cleveland; the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, in the Allerton Hotel; and the Society for Non-Destructive Testing, in the Hotel Hollenden.

The American Society for Metals will hold its annual Seminar on Saturday and Sunday, October 17 and 18. The subject of the 1953 Seminar is "Relation of Properties to Microstructure." Papers to be presented include "Theory of Dispersion Hardening," by E. W. Hart, research associate, General Electric Research Laboratory; and "Theory of the Relation of Magnetic Properties to Microstructure," by L. J. Dijkstra, Research Laboratories, Westinghouse Electric Corporation.

Among the papers of especial interest to metal-working production men to be read at technical sessions of the American Society for Metals are "Nitriding of Titanium with Ammonia," by J. L. Wyatt, assistant to technical manager, Horizons, Inc., and N. J. Grant, Associate Professor of Metallurgy, Massachusetts Institute of Technology; "Another Look at Quenchants, Cooling Rates, and Hardenability," by D. J. Carney, United States Steel Corporation; and "The Effect of Boron on Notch Toughness and Temper Embrittlement," by A. E. Powers and R. G. Carlson, Turbine Division, General Electric Co.

A.S.M. educational lectures to be presented at technical sessions in the Public Auditorium include "Case Hardening, Diffusion Coatings, and Selective Heat-Treatment," by Michael B. Bever, Department of Metallurgy, Massachusetts Institute of Technology; and "Practical Examples of Surface Protection," by Theodore Gaynor, inside shops superintendent, Bethlehem Steel Co.

Technical sessions of the American Welding Society will include papers entitled "Resistance Welding in Jet-Engine Manufacturing," by Frank J. Wallace, Pratt & Whitney Aircraft Division of United Aircraft Corporation; "Some Applications of High-Speed Motion Picture Photography to Resistance Welding," by I. S. Goodman, Westinghouse Electric Corporation; "Submerged Arc Welding of Chromium Bearing Steels," by Clarence E. Jackson and Arthur E. Shrubsall, Union Carbide and Carbon Laboratories; "Soldering of Aluminum," by James D. Dowd, Aluminum Company of America; and "Welding Characteristics of Titanium and Titanium Alloys," by Mario L. Ochieano, Lockheed Aircraft Corporation.

Other papers given at this Society's meetings will be "Inert-Gas-Shielded Metal-Arc Welding of Low-Carbon Steels," by George C. Christopher and R. C. Becker, International Harvester Co.; "Effect of Power Supply Characteristics on Sigma Welding," by W. H. Helmbrecht and R. L. Hackman, Linde Air Products Co.; "Weld Properties of a Carbon-Steel Electrode for Use with Inert Gas Shields," by Harry C. Cook and Gilbert R. Rothschild, Air Reduction Research Laboratories; "New Developments in Fluxes for Automatic Welding and Hard Surfacing," by L. K. Stringham, Lincoln Electric Co.; and "Multiple-Arc Submerged Arc Welding," by Theodore Ashton, Lincoln Electric Co.

Presidents of the participating societies for the ensuing year will be as follows: for the American Society for Metals, J. B. Austin, director of Research Laboratories, United States Steel Co.; for the American Welding Society, F. L. Plummer, director of engineering, Hammond Iron Works; for the American Institute of Mining and Metallurgical Engineers, Andrew Fletcher, president, St. Joseph Lead Co.; and for the Society for Non-Destructive Testing, Dr. Robert C. McMaster, supervisor of the Electrical Engineering Division, Battelle Memorial Institute.

The 1953 recipient of the American Society for Metals' Gold Medal Award will be Dr. George Sachs, Director of Metallurgical Research, Institute of Industrial Research, Syracuse University. William T. Ennor, assistant director of research, Aluminum Research Laboratories, Aluminum Company of America, is the 1953 winner of the Albert Sauveur Achievement Award, presented by the American Society for Metals. The A.S.M. Medal for the Advancement of Research will be presented to Hiland Garfield Batcheller, chairman of the board of Allegheny-Ludlum Steel Corporation.

Checking Gear Tooth Thickness with Variable Center-Distance Gage

By Louis D. Martin, Gear Consultant
Eastman Kodak Co., Camera Works Division
Rochester, N. Y.

BACKLASH has been defined in the nomenclature of the American Gear Manufacturers Association and the American Standards Association as the difference between the tooth thickness and space width of engaging gear teeth. In other words, it is the play between mating teeth of assembled gears.

The term "backlash" is often misused, being frequently applied to a single gear for the purpose of indicating a dimensional departure from some nominal size. A single gear has no backlash, as such, until it is meshed with another gear and mounted on centers in some mechanism.

The operator of a gear-cutting machine must determine the size of the gear teeth being cut in order to be sure that the gear will meet drawing specifications. Gear tooth size may be determined in several ways, for instance,

1. By a simple check of tooth space by means of measuring wires, while the gear is still on the gear-cutting machine.
2. By use of a gear tooth caliper for measuring the chordal thickness.
3. By means of a master of some kind, used with a gage of variable center distance.

When gear tooth thickness is measured by means of a master, the amount of radial displacement from the nominal setting gives an indication of the backlash when the gear is later assembled with an identical gear. The probable play or backlash of two identical gears when assembled, disregarding the influence of other errors, will be equal to four times the radial displacement from the nominal dimension times the tangent of the pressure angle.

A check of gear tooth thickness made by means of a master approaches closely to a functional check because it integrates other residual errors, such as tooth thickness variation, and errors in pitch, profile, and lead, over the arc of action. Such a check should have preference over other checks for tooth thickness which ignore the influence of the combined effect of the errors that affect size and angular transmission. Obviously, rather than talk about pitch diameter tolerance or backlash in a single gear, to be correct it is necessary to specify the tooth thickness variation from the standard tooth thickness.

Specifications should point out that it is not only necessary to know the tooth thickness of a single tooth, but also the integrated influence of tooth errors as they affect the meshing teeth through their arc of action. The need for an integrated check should be emphasized by some such expression as "Integrated tooth thickness change"—if desired, abbreviated to "Δ i.t." This would imply that the designer wanted the tooth thickness to be greater or less than standard, as in the case of long and short addendum gears. He has specified his requirements on the drawing, calling attention to the fact that the tooth thickness must be determined by an integrated check made by means of some kind of master.

The fine pitch field of gear designing is wedded to the composite check as a means of controlling

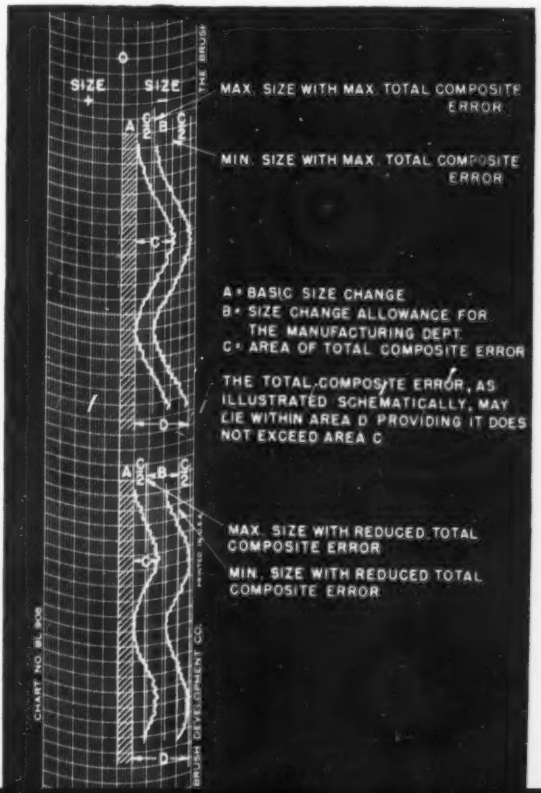


Chart illustrating recommended procedure for establishing tooth size and total composite error

gear quality. The composite check indicates not only the running quality of gear teeth but also the chordal thickness of the teeth. A great deal of confusion exists concerning the best means of setting up a size tolerance on the basis of a total radial displacement as read on the indicating device of a variable center-distance fixture.

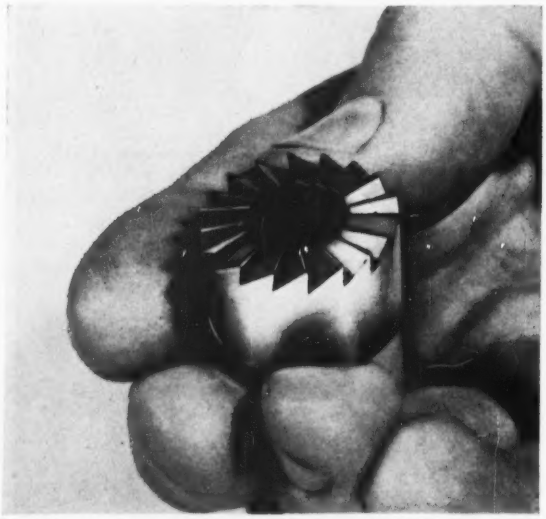
The operator of the checking instrument is generally told only that the indicator hand must register from one point to another and that the total radial displacement as recorded by the indicator, or the pen of a charting instrument, must fall within the established range, whatever it may be. How this limit was arrived at is the concern of the engineer, not the operator. In establishing the tolerance, the engineer must apply some realism and common sense. He must be able to prove, if the occasion arises, that the tolerance takes all variables into account.

A recommended procedure for establishing tooth size and total composite error as specified in AGMA Standard 236.02, "Inspection of Fine-Pitch Gears," is indicated by the chart in the illustration which was taken from a recording type of instrument. The reasoning and graphical presentation are applicable to any type of instrument. Referring to the chart, *A* is the basic size variation or integrated tooth thickness reduction, determined by the engineer; *B* is the allowance to the manufacturing department for tool wear; *C* is the allowance for total composite error as determined by the specified class obtained from the standard; and *D* is the total combined variation of size and total composite error. The total composite error can be anywhere within area *D*, provided it does not exceed area *C*. Note that the size allowance *B* for the shop is taken through the middle of the total composite error tolerance instead of from the high point. As the total composite error is reduced, a greater size allowance is permitted.

In determining the chordal thickness of gear teeth by this method, the total composite error is partially divorced from the measurement that controls size and quality. A pure size change is taken from the mean of the total composite error to the edge of boundary *A*.

This method is more realistic than the method where size measurements are taken from the so-called point of highest engagement (high point of total composite error) because (1) it results in better correlation with size measurements which ignore the bore; and (2) it takes into account the influence of probability laws. On parallel shaft drives, the chances of two similar gears being meshed so that their points of tightest engagement are together every time are remote with a random assembly procedure, and are affected by the number of teeth in the gears. The chances of high spots meeting in a compound train where one gear meshes with several dissimilar gears with different numbers of teeth are much more remote and difficult to analyze. It seems unrealistic to set up tolerances from a point of tight engagement. This idea probably stems from cases involving only two gears, such as bevel and worm gears, and should be discarded in the instance of parallel shaft drives.

With this method of establishing the tolerance build-up, the engineer can still prescribe exactly what he wants. He has the assurance that the shop will find less cause for lack of agreement between diverse methods, and also has the satisfaction of knowing that the newer method will come closer to meeting functional requirements.



Ratchet made of solid tungsten carbide which has effected substantial savings in maintenance costs and reduced machine "down" time in the operation of sawing machines. Made of Kennametal, this ratchet is 1 inch in diameter and has eighteen teeth of 10 pitch.

INGENIOUS *Mechanisms*

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

Simple Cam Made Practical by Increasing Speed

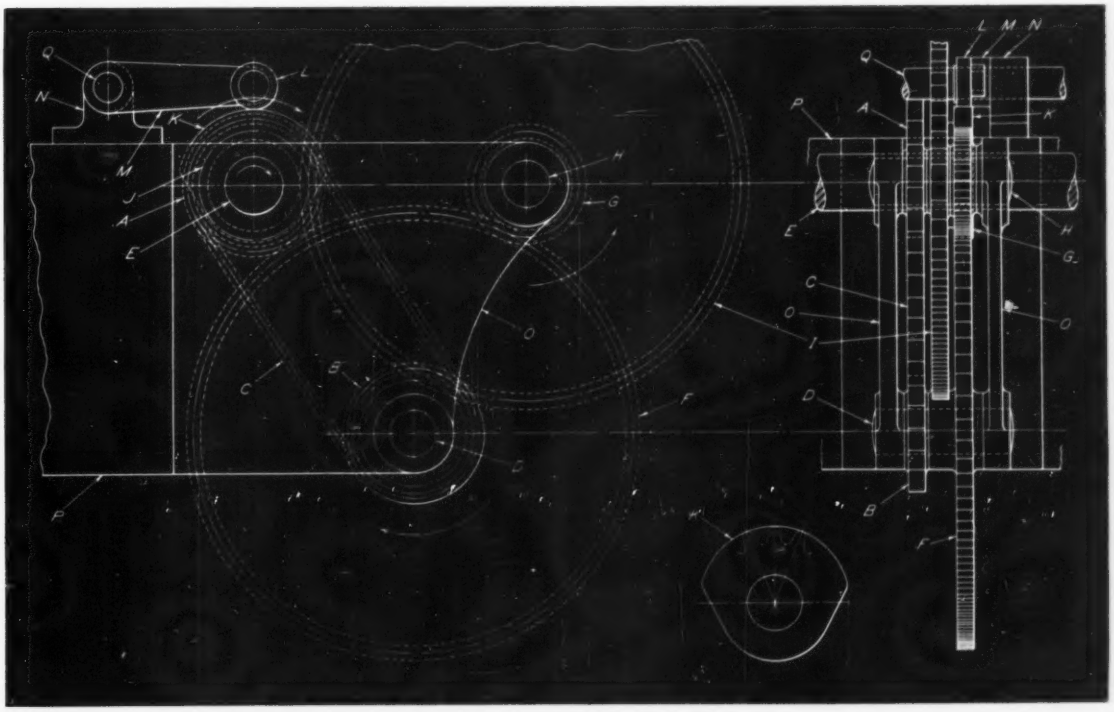
By L. KASPER

In the design of a machine for fabricating a wire product, it was required that a shaft be given an oscillating motion, by means of a cam, at the rate of sixteen oscillations for each cycle of the machine. The only source of power which could be utilized to operate the cam was another shaft, rotating at the rate of one revolution per cycle. A rough lay-out of a cam to produce the required oscillations indicated that the necessary rise of the cam and the number of lobes for the sixteen oscillations would be highly impractical from an engineering standpoint.

In order to have a cam that would be operable, it was decided to increase the number of cam revolutions per cycle, and make the cam outline produce the required motion at the increased rate of rotation. The drawing, which shows two views of the assembly, illustrates the mechanism which was designed.

The driving shaft *E*, running at one revolution per cycle, is supported by two brackets *O* mounted on the machine bed *P*. Sprocket *A* is keyed to shaft *E*, and drives sprocket *B* through chain *C*, also at one revolution per cycle. Sprocket *B* is keyed to shaft *D*, which rotates freely in its bearings, and carries gear *F*, also keyed to it. Gear *F* meshes with gear *G*, keyed to shaft *H*, which rotates freely in its bearings and carries gear *I*, also keyed to it. Gears *F* and *G* are in the ratio of 4 to 1, thus increasing the speed between shafts *E* and *H* in the same ratio.

Gear *I* meshes with gear *J*, which rotates freely on shaft *E*. Cam *K* is fastened to gear *J*, rotating as a unit with it. Since gears *I* and



Shaft (Q) oscillates sixteen times for each revolution of shaft (E), as the result of transmitting the drive through two sets of gears having 4 to 1 ratios.

J are also in the ratio of 4 to 1, cam K rotates at increased speed in the same ratio with shaft H. The two pairs of gears—F and G, and I and J—both of which are in the ratio of 4 to 1, create a rotation per cycle of cam K relative to that of shaft E in the ratio of 16 to 1, the product of the two gear ratios. Roller L, in contact with cam K, is thus able to transmit an oscillating motion to shaft Q, supported on bearing N, through lever M.

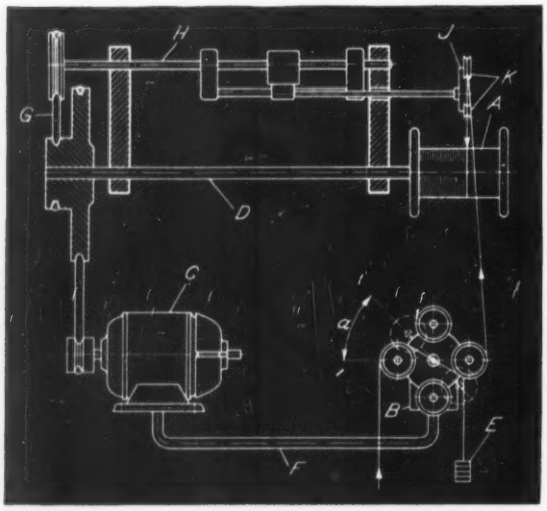
By increasing the rotative speed of cam K, it was possible to design the cam with one rise and fall instead of sixteen, as would be the case were the cam driven directly by shaft E. Also, it was possible to employ a roller follower, which was desirable, but could not be otherwise applied. The design of the cam K is illustrated at the bottom of the drawing, the dotted outline indicating the design which would have been necessary had the cam been attached directly to shaft E.

Tension Regulating Device for Coiling Machines

By Paul Grodzinski

One of the final phases in the fabrication of wire is the winding of the product around a reel as it leaves the annealing furnace. Winding is done by rotating the reel and guiding the wire back and forth along the axis of the reel until layers of wire have been built up.

If the reel rotates at a fixed speed, the tension on the wire increases for each layer, since the wire is forced to feed faster as the diameter of the reel body is built up. Eventually, the wire may snap, or some other failure take place. The accompanying diagram shows the principle of a mechanism designed to maintain a state of equilibrium in which the tension on the wire is constant.



The control unit (B) maintains constant tension on the wire by decelerating the motor (C).

In advancing from the annealing furnace to the reel A, the wire is directed through a control unit B. The reel is driven by a motor C through a drive-shaft D. A weight E produces sufficient drag in the control unit to keep the wire taut as it is wound on the reel. The tendency for the wire to speed up, and for the tension on the wire to increase, is countered by a movement of the control unit. This unit pivots an additional amount through angle a as each layer is built up on the reel.

In pivoting, the control unit actuates a rheostat which, through a cable F, decelerates the motor. Thus, by driving the reel at a progressively slower rate, the feed and tension of the wire are held constant. For any particular wire size, the tension can be set by varying the weight E in the control unit.

A V-belt G causes the wire-guide shaft H to turn with the drive-shaft so that the lineal movement of the wire-guide roller J is synchronized. This roller has a friction contact with two sheaves K, the axes of which are able to float out from a horizontal position to permit the wire to be properly wound around the reel.

* * *

New Rubber-to-Metal Bonding Process

A rubber-to-metal bonding process, known as "Permadizing," has been developed by the Stillman Rubber Co., Culver City, Calif. The process offers consistent, variation-free results in bonding aluminum to synthetic rubber, rubber compounds, and silicone. The corrosion-resistant bonded parts can be held to a finish of 5 microinches. Permadizing is recommended for a wide range of temperatures and is unaffected by aromatic fuels and hydraulic fluids.

* * *

Early Use of Nickel

Although used in natural alloys even in ancient times, nickel was unknown as an element until 1751. Prior to its isolation and naming in that year by the Swedish scientist Cronstedt, it was employed by ancient oriental people who fashioned useful implements out of meteorites composed of iron and nickel.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

A Common Problem in Gage and Die Design

By RONALD L. WAKELEE, Chicago, Ill.

The construction of a circle that is tangent to the base of a triangle and also to the other two sides extended beyond the base is a frequent requirement in die and gage design.

In Fig. 1, triangle ABC is shown with sides CB and CA extended and the exterior angles at B and A bisected. The intersection of these angle bisectors at point O is the center of the required tangent circle. The problem of determining OT, the radius of the tangent circle, may also be solved by trigonometry.

In triangle ABC of Fig. 2, side AB with angles a and b are given. To find R, the following step-by-step analysis may be used:

(1) $$\text{Angle } x = \frac{180 - a}{2} = 90 - \frac{a}{2}$$

(2) $$\text{Angle } y = \frac{180 - b}{2} = 90 - \frac{b}{2}$$

(3) $$OB = \frac{R}{\sin x}\ ; \text{ and } OA = \frac{R}{\sin y}$$

(4) $$AB = OB \cos x + OA \cos y$$

$$= \left(\frac{R}{\sin x}\right) \cos x + \left(\frac{R}{\sin y}\right) \cos y$$

$$= R \cot x + R \cot y$$

$$= R \cot \left(90 - \frac{a}{2}\right) + R \cot \left(90 - \frac{b}{2}\right)$$

$$= R \tan \frac{a}{2} + R \tan \frac{b}{2}$$

$$= R \left(\tan \frac{a}{2} + \tan \frac{b}{2}\right)$$

or,

(5) $$R = \frac{AB}{\tan \frac{a}{2} + \tan \frac{b}{2}}$$

The use of Equation 5 is demonstrated in the following example:

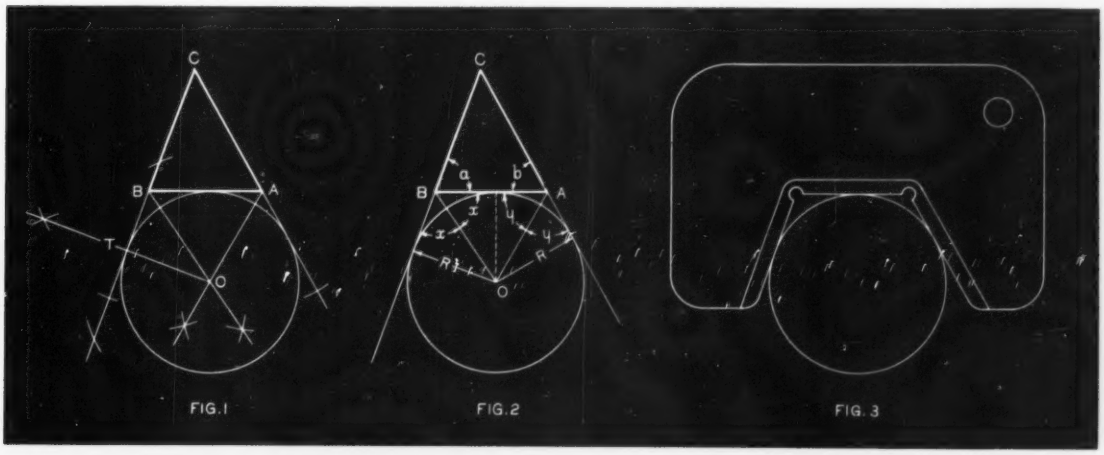


Fig. 1. Geometric construction used to determine the center of a circle tangent to a side of a triangle and also to the other two sides extended; Fig. 2. Diagram used to find the radius of the tangent circle by trigonometry; and Fig. 3. Checking the correctness of this gage is facilitated by the use of Formula 5

Let $AB = 1$ inch, $a = 70°$, and $b = 60°$.

$$\text{Tan } \frac{a}{2} = \tan \frac{70°}{2} = \tan 35° = 0.70021$$

$$\text{Tan } \frac{b}{2} = \tan \frac{60°}{2} = \tan 30° = 0.57735$$

$$R = \frac{1}{0.70021 + 0.57735} = 0.7827 \text{ inch.}$$

A gage of the type shown in Fig. 3 is a typical case in which Formula 5 can be applied. The correct angular relationship of three working surfaces is established by means of a sine bar. A disc (the diameter of which has been determined by this formula) is used with the gage to determine any inaccuracies of the linear dimensions. Discrepancies may be checked by using a comparator.

Improved Finger Clamps for the Toolmaker

By W. M. HALLIDAY, Birkdale, Southport, England

An effective finger clamp for securing work during machining or bench operations is shown in Fig. 1. Features of the clamp are a quick adjustment to the work thickness, a single screw, and a smooth lower-finger base which permits it to rest directly on machine tables or workbenches.

The device has a hardened and ground lower finger *A* having an integral extension *B* by which it can be gripped in a vise or bolted to a table. Two cylindrical posts *C* are anchored in reamed holes in the lower finger. The lower halves of the holes are of a reduced diameter to receive the ends of the posts. Screws or rivets run through countersunk holes in the base of the finger to the ends of the posts, fixing them firmly in position. The tops of the posts are similarly reduced, being secured to a bridge piece *D*.

The upper finger *E* is a close sliding fit over the posts. Its left-hand end is tapped for the clamping screw *F*. A bell-shaped clamping pad *G* is retained loosely on the peened bottom end of the screw. After the work is located over the anvil of the lower finger, the upper finger is slid down on the posts until the clamping pad bears on the work.

As this screw is being tightened, the upper finger is locked in position on the posts by the slight pivoting action along the axis of the finger. Upon slackening the screw, the work is released, and the finger is free to slide up or down the posts. A 90-degree vee *H* cut into the surface of the anvil is helpful in securing cylindrical objects.

In Fig. 2 is shown a modified design of this clamp, suited for holding tapered work as well as parallel stock. Here, the upper finger *E* has a vertical slot *J* at its left-hand end, which is cross-drilled to retain a pin *K*. The pin, free to turn, is tapped, and serves as a nut for the clamping screw *F*. When the upper finger is slid down, the screw is able to turn to square itself with the taper of the work.

Should the work have to be held so that its taper is not in line with axis of the upper finger, then a lower finger incorporating a universal

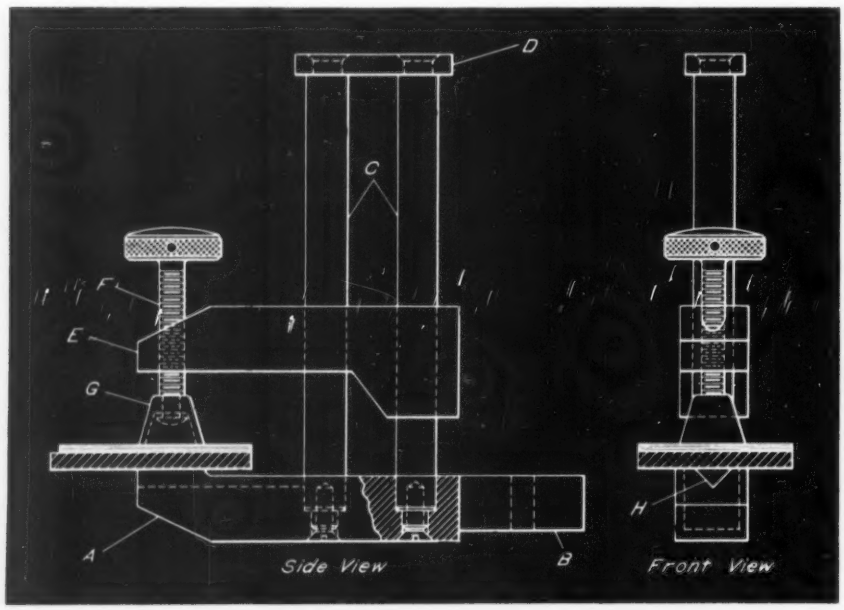


Fig. 1. The upper finger (E) is secured in position by its slight pivoting action on the posts (C) when the clamping screw (F) is tightened.

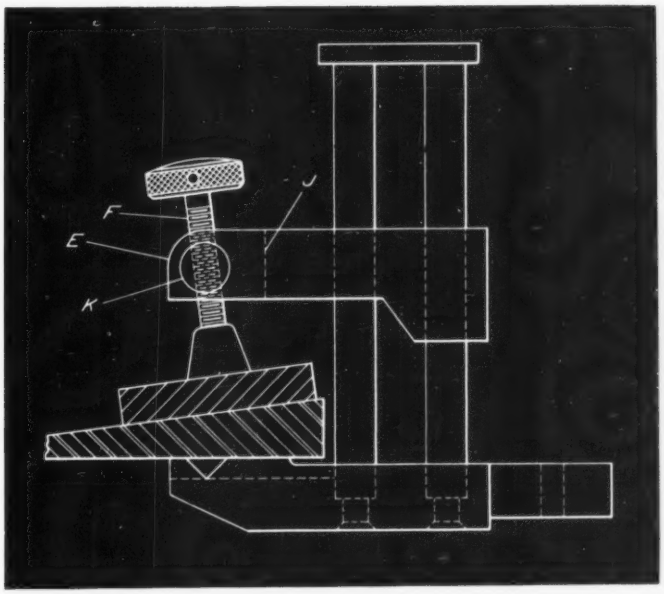


Fig. 2. The ability of the pin (K) to turn permits the clamping screw (F) to square itself with the taper of the work.

swivel, as in Fig. 3, can be constructed. In this case, the left-hand end of the lower finger *A* is made shorter and drilled centrally to receive the cylindrical shank *L* of a hardened block *M*. A retaining pin *N* engages an annular groove *O* in the shank, leaving the block free to rotate without working loose from the finger. Leg *Q* of anvil *R* is hinged in slot *P*. The anvil can be lightly serrated on top and provided with two 90-degree vees at right angles to each other. The two views in Fig. 3 show the swivel movements that are obtainable. The upper finger (not shown) may be constructed as in Figs. 1 or 2, although the design in Fig. 1 is recommended, being somewhat simpler.

Controlled Atmosphere for Annealing Aluminum Uses Nitrogen

One of the innovations introduced in the new aluminum strip mill, recently placed in production by the Scovill Mfg. Co., Waterbury, Conn., is the use of furnaces whereby all aluminum production is annealed under complete atmospheric control with a substitution of nitrogen for oxygen. This controlled atmosphere is injected after all oxygen, carbon dioxide, and oil have been forced from the enclosure, a bell type furnace. The nitrogen atmosphere minimizes the formation of oxides, thereby reducing costly cleaning and finishing operations.

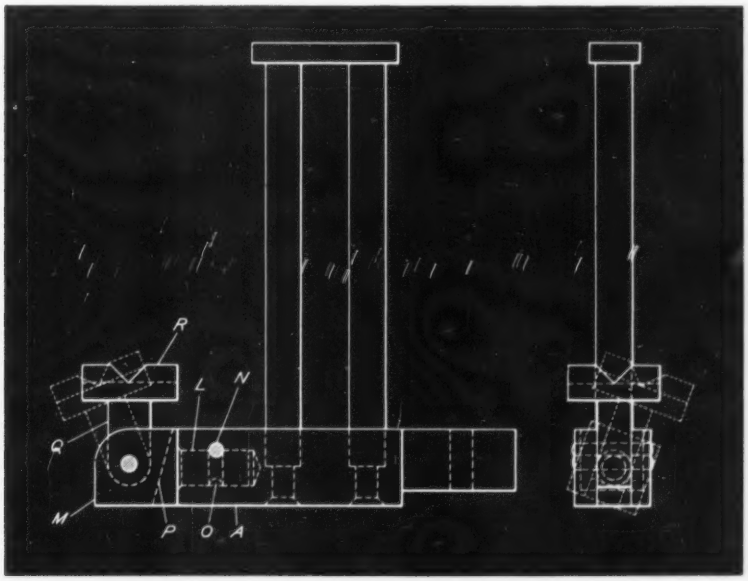


Fig. 3. With this construction, the taper of the work need not be restricted to the line of the axis of the upper finger.



The Sales Engineer and His Problems

By BERNARD LESTER
Management Consulting Engineer
New York

Do We Keep Informed — And How?

THE general manager of a successful concern manufacturing metal parts recently exclaimed: "Our top men here must keep up-to-date—new ideas, new methods—and all that. Last week one sales engineer gave our promotion man a darned good series of follow-up letters his firm uses. With a few changes they'll fit our needs. They are really worth money." He was quick to add: "Do you think that salesman won't get preference from us?"

This manager was restating an old principle of sales service, that is, selling useful ideas in order to sell equipment. Prosperity has shortened sales focus. To revitalize sales skill, we must pay more attention to being better informed and providing all sorts of helpful ideas apart from the specific equipment we sell.

How can we stir our minds to the value of selling new ideas? How can we increase our stockpile of ideas? How can we effectively use them in selling?

1. How can we sell new ideas?

Examine the last few calls we made. Ten to one, most calls ended after we had solved the immediate problem involved. Weren't there several instances in which we could have projected ourselves into the prospect's problems, provided we were prepared to speak with authority over a broader scope than the apparatus we sell?

Perhaps there was a chance to concentrate on the shop or department machine lay-out and tactfully suggest improvements. There might have been particular operations that could be improved, in our opinion. Duties of men might be combined without difficulty, and man-hours reduced. New and improved materials, possibly unfamiliar to the prospect, might have been suggested for trial. Perhaps the prospect's records for production, stock parts, or cost methods could be improved. Such points as these are avenues of helpfulness, if we are only conscious of the wide variety of ways in which we can help prospects.

2. How can we broaden our stockpile of ideas useful in selling?

By acquiring the habit of endlessly observing and interrogating. Certainly a live sales engineer has an enormous advantage as he goes from plant to plant. He can pick up a wealth of ideas that can improve organization, operations, and processes. A keen roving eye and probing lips can help us uncover, evaluate, and classify ideas. By being closely familiar with our own operations, there may be practices and procedures that we can pass on to our prospects.

Trade magazines and engineering journals are a prime source of information. The "What's New" page, the technical article, and the informative advertisement are especially helpful, if only we schedule reading as a "must." Information will appear more real and useful as, upon reading, we conclude every impression with the thought "Whom among my lists of prospects might this knowledge help?"

3. How can we make the best use of these ideas in selling?

Much depends upon our approach to the prospect. Obviously, on the pending order we must appeal to the interest of the prospect, and clean up all points where an inquiry is involved. But every specific negotiation for equipment bears some relationship to the purchaser's over-all business endeavors.

So many questions can be raised by diplomatic interrogation. So many problems can be unfolded. Pick out one or two for concentration.

Do some further investigation on the side and, if at all possible, make full use of an opportunity to come back to the prospect with a well formed answer.

It is ridiculous to expect any sales engineer to be prepared to solve all his prospect's problems. At best, he can solve only a few, but often he can tell the prospect where and how he can get the answer. Herein lies the framework of broad-gage selling—the kind of selling that puts us head and shoulders above competition in a market of growing selectivity.

As a purchaser, we love the retail salesman who gives us something more than just the actual article we buy. It may be an extra ounce of tomatoes on the scale, or an extra ribbon-tied wrapping to enclose the box of candy. The greatest extra the sales engineer can give is ideas—ideas that will help the particular prospect.

* * *

Industrial Wiper Made of a New Paper Product

A paper wiper developed to meet varied needs of industry is being placed on the market by the Scott Paper Co., Chester, Pa. Each wiper consists of two Perf-Embossed sheets which are attached to form one sheet, thus providing a thorough cleaning action and maximum dirt retention. A chemical treatment insures strength when the wiper is used wet.

These wipers may be employed for cleaning machinery and products. They may also be used by workmen in cleaning their hands and faces. Inexpensive, the wipers can immediately be discarded, thus eliminating the possibility of using for a second time a wiper that might contain steel shavings, filings, or chips, from a previous job which may cut the operator.

Method of Bonding Plastic to Steel or Aluminum

A method of laminating vinyl plastic and sheet steel or aluminum—which will make these metals colorful, decorative, and permanently rustproof and corrosion-proof—has been developed by the Naugatuck Chemical Division, United States Rubber Co. The process combines the structural strength of metal with the exceptional corrosion resistance of brightly colored vinyl plastic.

The process consists of bonding Marvinol (a Naugatuck vinyl) to sheet steel or aluminum. The resulting laminate, called Marvinol-Metal Laminate, has a higher abrasion resistance than varnish, paint, and baked enamel finishes. In addition, the bond of the plastic to the metal is so strong that 180-degree bends and deep draws can be made without separating the vinyl from the metal.

The laminate is made by rolling rigid or semi-rigid Marvinol vinyl sheet onto heated adhesive-coated metal sheets or strips. The rolling pressure is not high. After rolling, adhesion is effected in seconds under heat lamps or another suitable heat source. The secret of the process lies in a special adhesive and proper preparation of the metal and the vinyl plastic compound. To date, cold-rolled steel, hot-rolled pickled steel, and aluminum, from 18 to 34 gage, have been used to make the laminate. Vinyl films have ranged from 0.002 to 0.020 inch thick. Tests indicate an adhesion in excess of 40 pounds per square inch of width. Regular metal-forming equipment can be used for fabrication.



Using one of the Scott industrial wipers to clean chips from T-slots of a milling machine table

LATEST DEVELOPMENTS IN *Shop*

Gleason Gear Generators, Gear Testers, and Cutter Sharpening Machine

Gleason Works, Dept. M, 1000 University Ave., Rochester 3, N. Y., has brought out five new machines which were exhibited for the first time at the Third European Machine Tool Exhibition recently held in Brussels, Belgium.

The No. 104 straight bevel Coniflex gear generator, shown in Fig. 1, is a completely automatic, high-speed machine for cutting straight Coniflex gears. It was designed for rapid production of high-quality gears, and has a capacity for cutting three diametral pitch gears from the solid in sizes up to 8 1/2 inches in diameter and face width of 1 3/8 inches. Gears cut on this machine are completely interchangeable with those cut on Gleason two-tool generators. Although it is recommended that gears be designed according to the Gleason 20-degree straight bevel gear system, gears having any standard pressure angle from 14 1/2 to 25 degrees can be produced, using standard cutters. Special tooth designs can also be accommodated.

The No. 106 hypoid gear generator, Fig. 2, is another Gleason automatic machine designed for high-speed cutting of spiral bevel, hypoid, and Zerol bevel gears from 2 to 8 1/2 inches in diameter in either production or jobbing quantities. This machine uses Gleason spiral cutters from 1 1/2 to 7 1/2 inches in diameter. It is readily adaptable for cutting automotive spiral bevel and hypoid pinions.

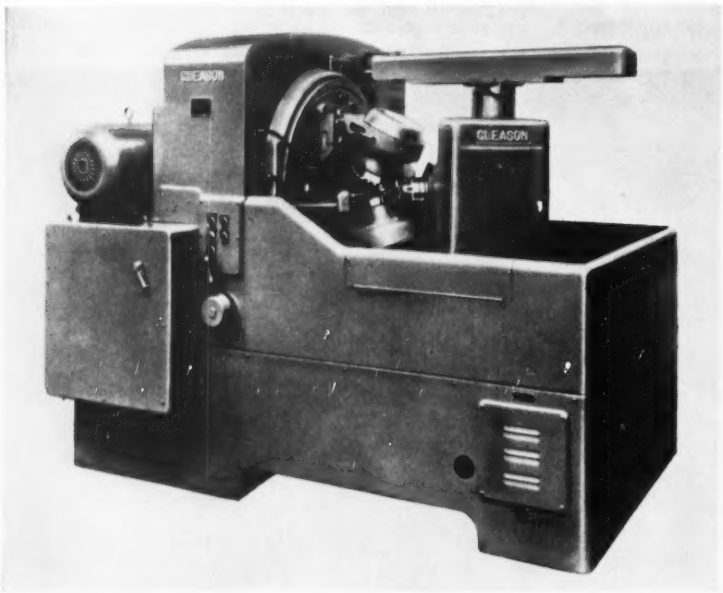


Fig. 1. Gleason straight bevel Coniflex gear generator

In Fig. 3 is shown the Gleason No. 104 angular hypoid gear tester developed for testing the running qualities, as well as the tooth spacing and concentricity, of bevel and hypoid gears. The machine will test fine-pitch bevel gears, of any shaft angle and up to 4 1/4 inches in diameter, such as those used in instrument and control equipment. It is especially well suited for testing hand-operated gears, fine-pitch gears that must run with a minimum of backlash, and gears that operate at high speeds. Gears can be tested by running them with mating gears or with sample gears.

The Gleason No. 104 spur gear tester seen in Fig. 4 is used for testing the running qualities, as well as the tooth spacing and concentricity, of both spur and helical gears. The machine will test fine-pitch gears with a center distance up to 4 1/2 inches. It is adapted for testing instrument gears and precision hand-operated gears, gears of fine pitch that must operate with a minimum of backlash, and gears that must operate at high speeds. The tests can be made with mating gears running together or with master gears.

Illustrated in Fig. 5 is a No. 104 Coniflex cutter sharpener of new design embodying some of the features previously incorporated in the Gleason automatic sharpeners to obtain a good finish, eliminate burning, and increase cutter life. A rapid rate of sharpening can be maintained, especially when handling small cutters. This machine will sharpen Coniflex disc type cutters 4 1/2 and 9

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

inches in diameter. It uses a conical grinding wheel with a stroke designed to generate the sharpening plane. The small area of contact between the grinding wheel and the tool sharpening plane serves to eliminate burning, while the wheel stroke produces a superior finish without any loss in sharpening time.

Automatic feed of the wheel is provided in timed relation to the wheel stroke, so that a controlled amount of stock is removed at each pass. The cycle is set up to produce twenty passes, which remove approximately 0.004 inch from the blade surface. In this manner, optimum grinding conditions are maintained. If more than 0.004 inch of stock must be removed, a dial adjustment on the work-head permits the cycle to be repeated until the desired result is obtained. This control eliminates unnecessary grinding and lengthens the life of the cutters.

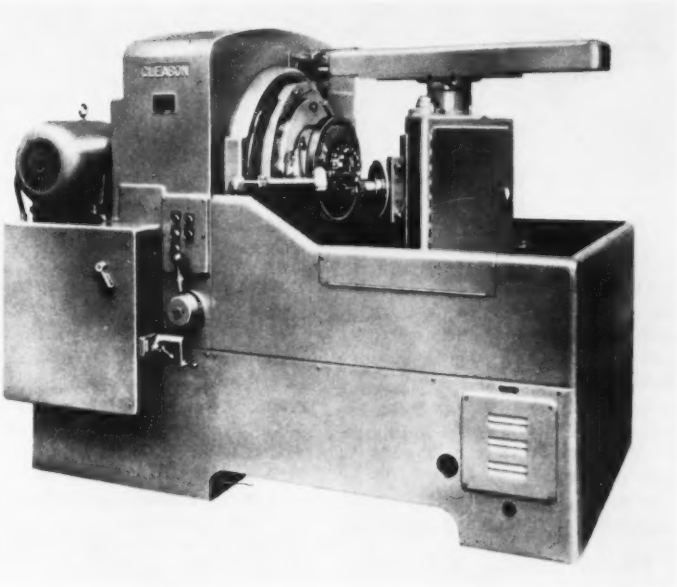


Fig. 2. The No. 106 hypoid gear generator



Fig. 3. Gleason angular hypoid gear tester



Fig. 4. Spur gear tester made by Gleason Works

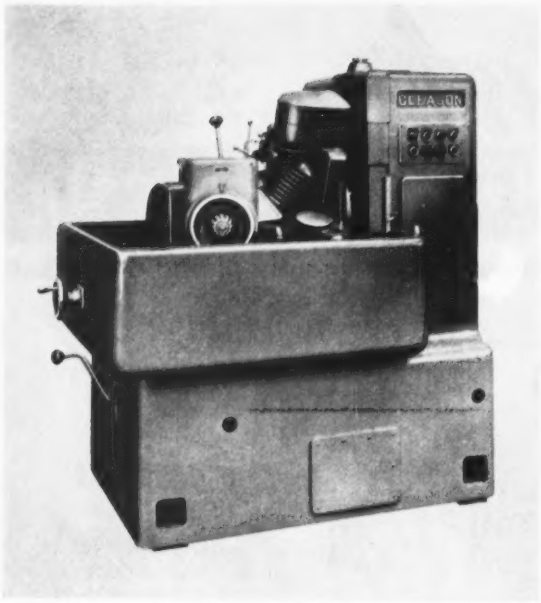
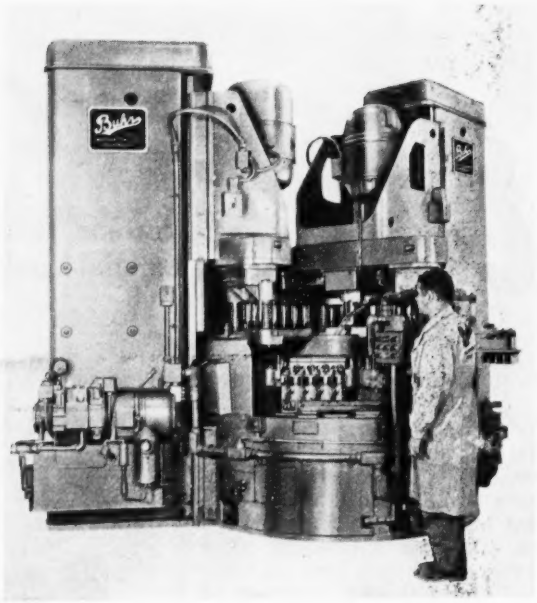


Fig. 5. Gleason Coniflex cutter sharpening machine



Buhr automatic machine for processing connecting-rods

The grinding head is adjustable 360 degrees about a horizontal axis. The use of angular settings for the grinding wheel enables right- and left-hand cutters to be ground with only small positioning changes. The wide range of the machine adjustments permits a large variety of cutters to be sharpened, including blades with high hook and side rake angles.

Pereco Carbon Resistor Type Tube Furnace

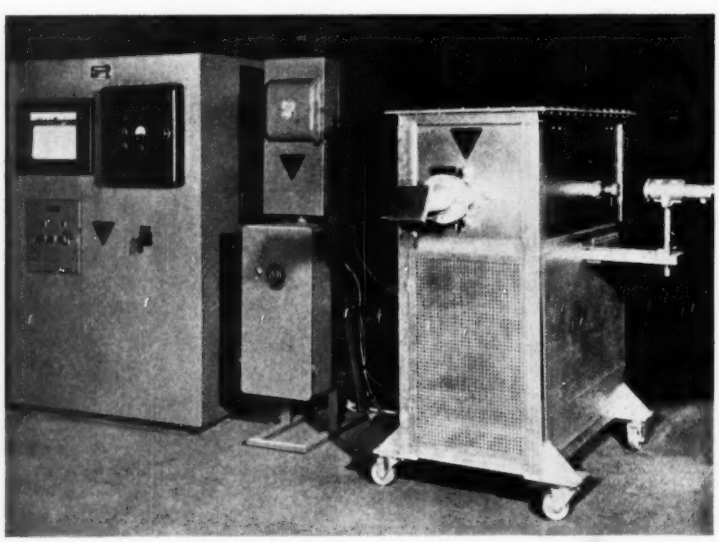
A Model CT-312 carbon resistor type tube furnace for ultra-high temperature work in the metallurgical field and for use in forming fabricating, or processing of ceramic and refractory materials has recently been announced by the Pereny Equipment Co., Dept. M, Columbus, Ohio. This furnace is capable of rapid warm-up to 5000 degrees F. in approximately two hours. The even temperature zone of the tube furnace is 12 by 3 by 26 inches.

Elements of the furnace are water-cooled and completely protected with electrical interlocks. The furnace is automatically shut down in the event of water-flow failure to either or both the transformer or electrodes. The furnace is equipped with "Ignitrol-Thyratron" or "Saturable" reactor capable of supplying power that is variable from 1 to 100 per cent of the connected load.

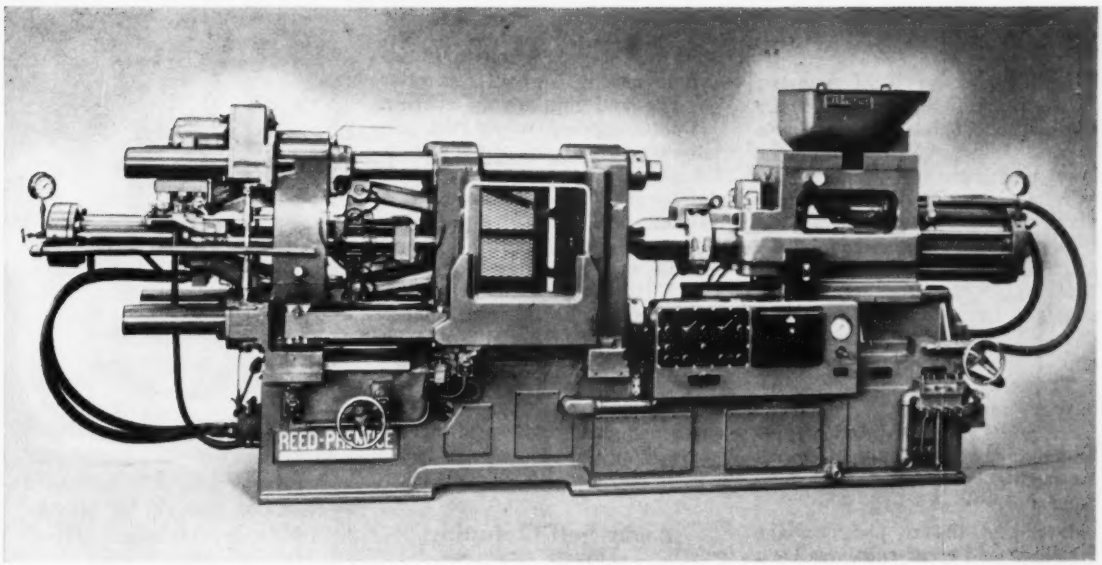
Buhr Two-Column Automatic Machine for Drilling, Reaming, and Chamfering Connecting Rods

A two-column automatic machine for drilling, reaming, and chamfering connecting-rods has just been completed by the Buhr Machine Tool Co., Dept. M, Ann Arbor, Mich., for use in an automobile manufacturing plant. The machine is designed to process 565 connecting-rods an hour and is arranged with tool-steel, laminated, hardened and ground ways.

The parts are loaded in the machine manually by the operator, after which they are hydraulically clamped, machined, and automatically ejected. The eight-station work-holding fixture is mounted on an index table 60 inches in diameter. Heavy-duty ball-bearing construction is provided for all spindles. Other features include automatic lubrication throughout the machine and specially designed safety devices.



Carbon resistor type tube furnace brought out by the Pereny Equipment Co.



Plastic injection molding machine brought out by the Reed-Prentice Corporation

Reed-Prentice Plastic Injection Molding Machine

Rugged tie-bar construction, central controls, high plasticizing capacity and a feed hopper of new design are features of the model 450T plastic injection molding machine built in 20- and 24-ounce capacity sizes by the Reed-Prentice Corporation, Dept. M, Worcester 4, Mass. These machines have four 5-inch diameter tie-bars that form a sturdy frame for the mold-locking mechanism and the die platens. The platens measure 45 by 40 inches. The rated casting area in the mold is 200 square inches.

The machine develops a positive mold-locking pressure of 450 tons and has a 16-inch stroke that is independent of the mold thickness. The die stroke is readily adjustable through a new mechanism in the toggle cylinder. A central operating panel controls the movement of die-plate and plunger. This panel also houses three electrical timers for semi-automatic or fully automatic operation and a fourth timer which governs the period during which full delivery from both hydraulic pumps is applied to the plunger in order to give rapid injection.

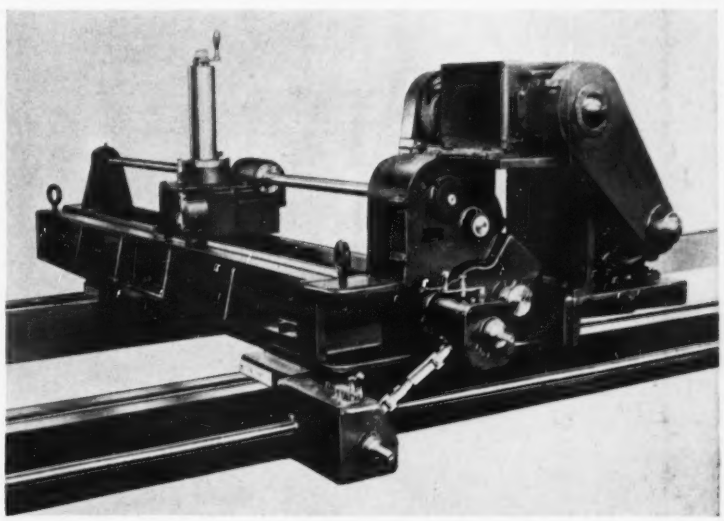
The heating cylinder on these machines plasticizes up to 125 pounds of material per hour. It is mounted on vertical ways to permit easy removal from the injection housing. The hopper accommodates a standard 200-pound material drum set at an angle of 45 degrees.

A separate steel cabinet houses electrical controls and two proportioning type pyrometers for accurate temperature control of both the front and rear of the heating cylinder.

Portable Universal Milling Machine

Forney's Inc., Dept. M, Box 310, New Castle, Pa., has placed on the market a portable, universal milling and facing machine designed for work difficult or impractical to remove to the machine shop. The ease with which this machine can be taken to the job has extended its application into many fields. It is useful in resurfacing hammer bases in forge plants, and is adaptable for operation on motor bases, bedplates, and similar components.

Spindle speeds range from 9 to 72 R.P.M. Cutters from 3 to 15 inches in diameter can be used. Any surface angle can be maintained and surfaces up to 84 inches in width can be accurately milled. Longitudinal travel rails of any length can be furnished.



Portable universal milling and facing machine placed on the market by Forney's Inc.

Gray Planer Type Double-Housing Milling Machine

The G. A. Gray Co., Dept. M, 3611 Woodburn Ave., Cincinnati 7, Ohio, has just completed for the American Locomotive Co. a 54- by 48-inch by 20-foot planer type, double-housing milling machine which embodies many new features. Each of the four independent unit milling heads of this machine is equipped with a 50-H.P. spindle motor to provide adequate power for the heavy-duty milling of steel fabrications and castings with carbide cutters.

The straight-line housings now have 27-inch faces. These larger faces and the full-depth straight-line outer wall provide increased strength and rigidity for the side-head and rail support.

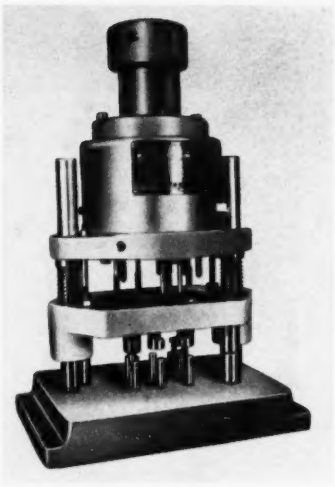
Over-size square locks on the housings and cross-rail have been designed to absorb increased feeding pressures when cutting in the forward or reverse directions. Dovetails have been eliminated, and the housings have square lips 4 inches thick. All gibs, plates, and bearings are faced with laminated plastic plates. Thus, there are no metal-to-metal bearings and the chances of scoring are almost non-existent. The running clearances are reduced, and more accurate head alignment is insured, making higher feed rates possible and minimizing chatter.

Double-opposed taper gibs permit easy adjustment of the spindle tram to facilitate taking finer finish cuts with precision laps. A 14-inch quill travel gives an effective machining range. Eighteen spindle speeds ranging from 10 to 500 R.P.M. are available.

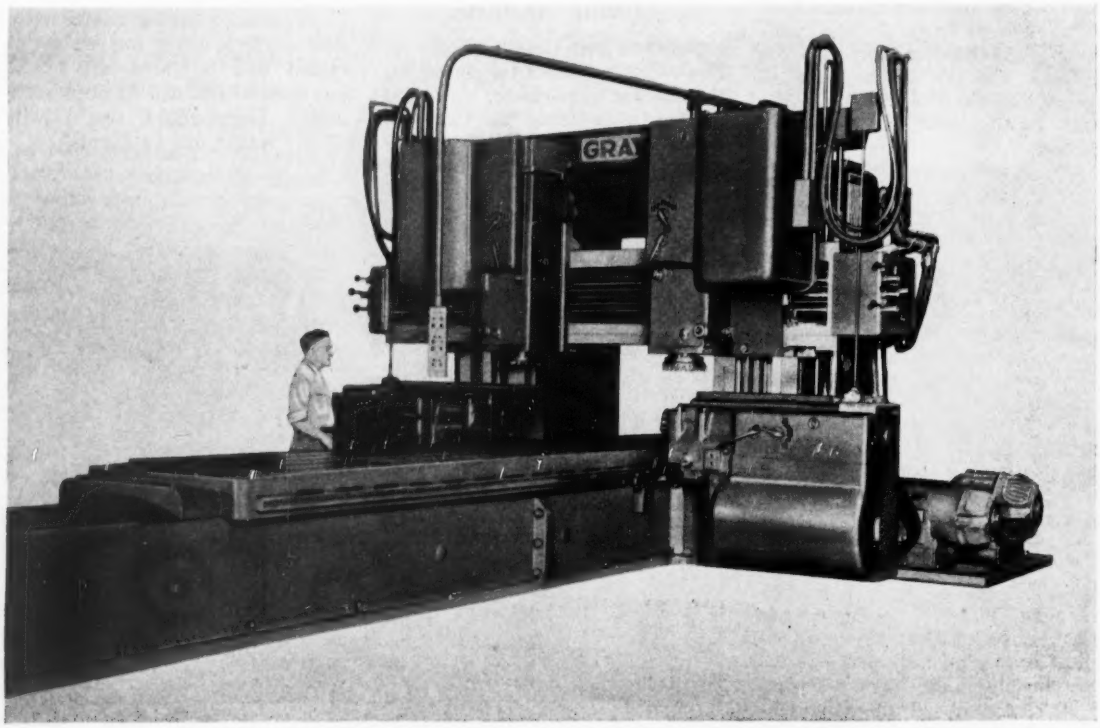
Power rail feed is now provided on all double-housing millers. Saddle type right-angle attachments with power rail feed give added versatility. A power head swiveling arrangement with push-button control for Gray offset rail heads can be obtained.

Zagar Self-Clamping Drill Jigs

Zagar Tool, Inc., Dept. M, 24000 Lakeland Blvd., Cleveland 23, Ohio, has recently designed a line of self-clamping drill jigs to be used in conjunction with Zagar gearless multiple spindle drill heads. Four distinct types, which handle hole patterns from 3 to 15 inches in diameter, can be used with the drill heads to perform drilling, reaming, and tapping operations on standard drill presses and tapping machines. In operation, self-clamping is accomplished by the downward stroke of the drill-press spindle exerting force on the drill head, which, in turn, transmits the force to the bushing plate. The bushing plate locates the work-piece, which then is firmly clamped by springs be-



Self-clamping drill jig used in conjunction with Zagar multiple-spindle drill head



Planer type double-housing milling machine of new design built by the G. A. Gray Co.

tween the plate and the drill head. After completing its downward progress, the drill head is retracted, releasing the force on the springs and automatically unclamping the part.

Natco Two-Way "Holesteel" Machine for Processing Tractor Track Rollers

A two-way machine has recently been developed by the National Automatic Tool Co., Dept. M, Richmond, Ind., for complete automation and flexibility in the loading, drilling, countersinking, tapping, and unloading of tractor track rollers. Provision has been made for handling three sizes of rollers without changing the setup or touching the work by hand. The "Holesteel" machine handles either right- or left-hand parts.

As shown in the illustration, the part is rolled on a track into the preloading position at the front of the machine. It is then elevated automatically to a higher level, from which it is rolled into position opposite one of three arbors where the part is automatically clamped in the trunnion fixture. From this loading and unloading position the machine automatically indexes and carries the part into a second position for drilling and countersinking operaunloading position the machine is again indexed automatically, bringing the part into position for tapping both ends.

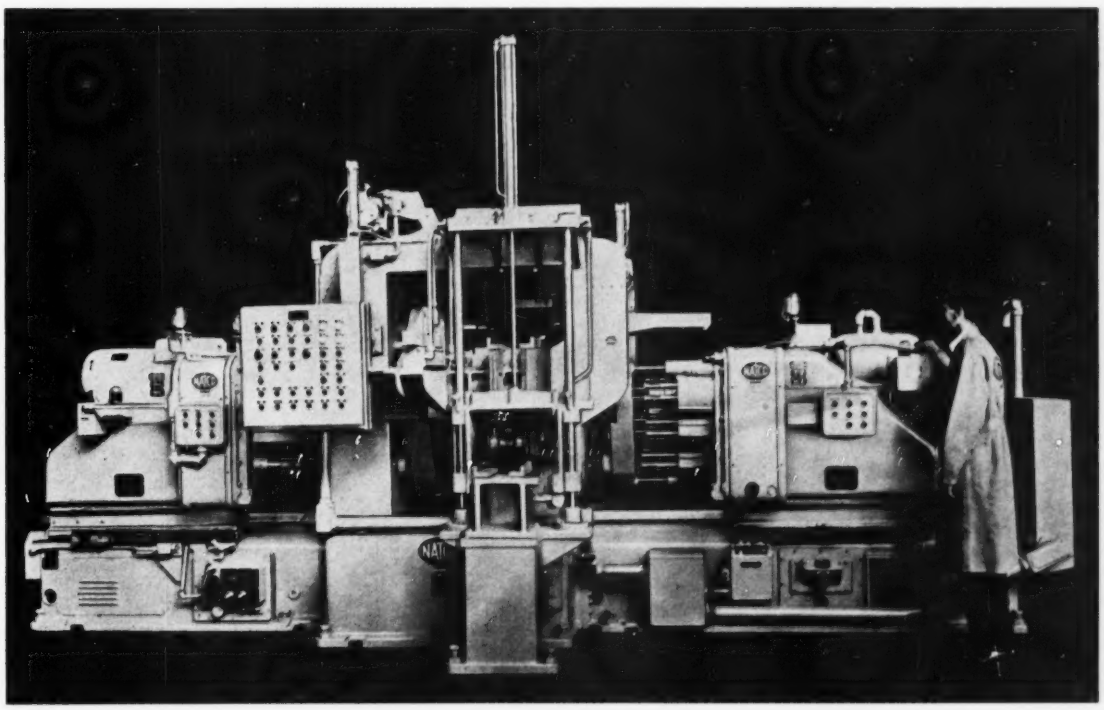
The third indexing movement brings the part to the unloading position where it is automatically unclamped and rolled out of the machine on a track. Only one size of tractor rollers is machined at a time. Production is at the rate of seventy-two parts per hour.

Hammond Carbide Tool Finishing Machine

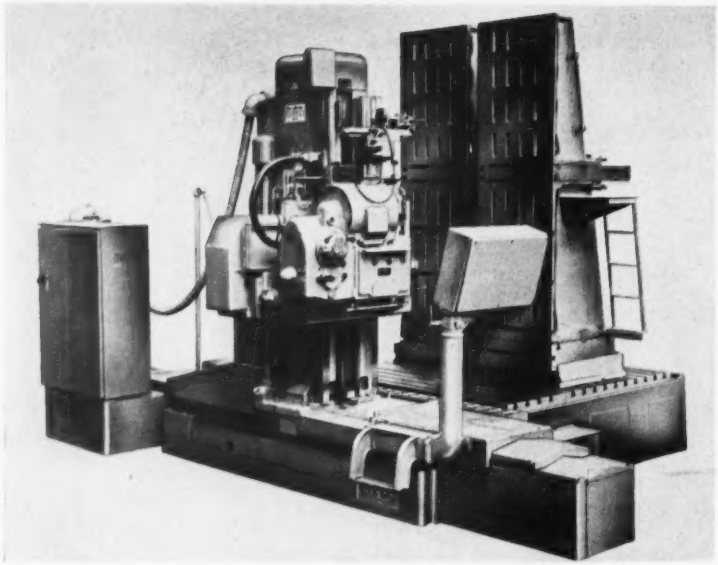
A carbide tool finishing machine that uses abrasive belts has been placed on the market by Hammond Machinery Builders, Inc., Dept. M, 1600 Douglas Ave., Kalamazoo, Mich. With this machine and method developed by the company, it is said to be possible to give single-point carbide tools a final finish without using diamond wheels and without requiring highly skilled operators. This Model 454 carbide belt finisher is designed for final finishing with an abrasive belt after rough-grinding with a silicon carbide wheel. It has a tungsten-carbide faced platen which permits the finishing of end, top, and side clearance angles of the tool. Only one setting is required to suit all sizes of tools. Abrasive belts can be changed without disturbing the setting.



Abrasive belt type carbide tool finishing machine



"Holesteel" machine developed for automatic processing of tractor track rollers



Pratt & Whitney medium size Keller tracer controlled milling machine

Pratt & Whitney Medium-Size Keller Machine

An automatic, electric tracer controlled milling machine designated the Keller Type BG-21—patterned after the Keller BG-22 model but smaller in size and capacity—has been developed by Pratt & Whitney, Division Niles-Bement-Pond Co., Dept. M, West Hartford 1, Conn. Although this machine has been specifically designed for electric tracer control it can also be used as a regular milling machine.

Tracer milling can be done in two ways on this machine. First, the profiles of sheet-metal templates or the side walls of models can be duplicated by following their outlines with a profiling tracer which causes an end mill to cut the work to the required shape; and second, a three-dimensional shape can be duplicated by making a series of parallel passes over the model with a three-dimensional tracer to control the cuts made by the milling cutter. Conversion from one type of milling to the other is easy.

The BG-21 machine is of horizontal design, which provides maximum support for the spindle head. Both the spindle and the tracer are adjustable. Consequently, it is not necessary to locate the work and model in exact relation to each other.

Lubrication is simplified by using a central oiling system. A pump provides quick, positive lubrication to all important surfaces on the machine, giving pressures up to 1000 pounds per square inch. All sliding surfaces have phenolic-to-metal contacts and all leadscrews run through molded phenolic nuts. Ample lubrication and the lack of metal-to-metal sliding surfaces virtually eliminate scoring of the ways.

A speed control automatically regulates the relative component travel speeds over irregular shapes to produce a constant surface cutting speed, the operator simply making a setting for the desired maximum travel speed. As on other Keller machines, a power-limiting relay provides protection against tool breakage from overloads produced by variable stock removal. The operator sets up the maximum travel speeds, after which the travel motion of the cutter automatically slows down to a safe speed during heavy loading and resumes maximum speed as it clears itself. This machine can be obtained in five different sizes, ranging from 4 by 2 1/2 feet up to 10 by 4 feet. Special two-spindle models are also available. Rapid traverse up to 250 inches per minute and automatic chip conveyors are standard on the larger models.

Avey Multiple-Spindle Drilling Machine

A special eight-spindle No. 2 BMA-6 drilling machine with a spindle overhang of 12 inches and distance between spindles of 15 inches has been built by the Avey Drilling Machine Co., Inc., Dept. M, Cincinnati 1, Ohio. This machine has a head travel of 7 inches and a rack travel of 6 inches. Six spindle speeds are available in the standard speed range.



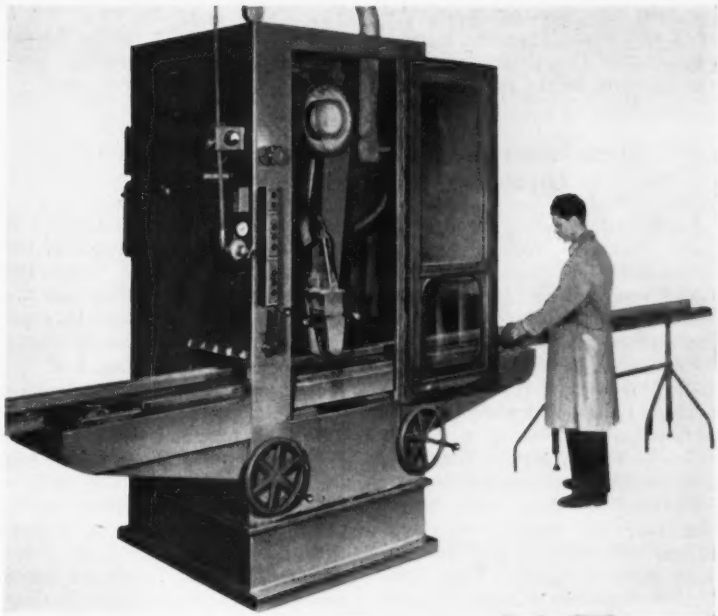
Multiple-spindle drilling machine made by Avey Drilling Machine Co., Inc.

All top columns of the machine are mounted on a fabricated steel lower column base and table. The table is actuated by power through a lead-screw, and the motor is operated by remote push-button control. The working surface of the table is 20 by 120 inches. All spindles are individually motor-driven by 2-H.P. 1200-R.P.M. NEMA type motors. Standard power feed heads, reversing motors, and controls for tapping are used throughout. Thus, the machines can be employed for a wide variety of work requiring hand feeding, power feeding, or tapping.

Equipment Developed for Finishing Aluminum Extrusions

The combination of abrasive belts developed by the Carborundum Co., Dept. M, Niagara Falls, N. Y., and of Curtis Straight-O-Matic machines is being used to advantage in the production of aluminum extrusions, such as widely used in the manufacture of many products, including metal doors, window frames, and ornamental trim. The extrusions for such purposes usually come in 21-foot lengths and are normally given a satin or anodized finish, which requires preparatory grinding, sanding, or polishing.

The set-up shown in the illustration accomplishes the polishing of extruded aluminum at an unusually high production rate. One pass with a 120-grit belt, at a feeding speed of 10 to 15 feet per minute, has been found sufficient to remove surface imperfections or scratches from the extrusions. Surface finishes obtained with 120- to 400-grit abrasive belts are suitable for anodizing.

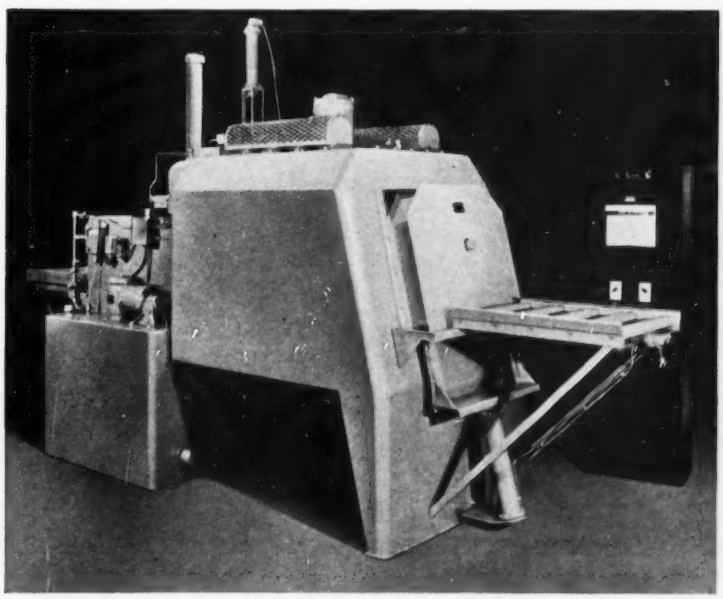


Curtis Straight-O-Matic machine equipped with abrasive belts recently developed by the Carborundum Co. for polishing aluminum extrusions

Ipsen Heat-Treating Unit with Automatic Handling

An automatic heat-treating unit with a work capacity of 300 pounds per hour has been brought out by Ipsen Industries, Inc., Dept. M, 715 S. Main St., Rockford, Ill. Operating temperatures up to 1850 degrees F. through forced-convection heating and radiant tubes, together with controlled-atmosphere and automatic straight-through operation from heating to cooling, are some of the features of this unit. Atmosphere control is maintained during both heating and quenching.

The forced-convection heating system of this T-300 heat-treating unit is similar to the system employed in the T-400, described in the January, 1953, number of MACHINERY, page 223. It consists of non-alloy radiant heating tubes, baffles, and a fan mounted in the roof of the furnace. Straight-through operation saves handling time and loading delays. After heating for the proper length of time, the work is transferred automatically from the heating zone to a quench cool rack which either holds the load for atmosphere cooling or lowers it for oil quench, whichever has been preselected. A new load can then be



Ipsen heat-treating unit featuring automatic handling

put into the heating zone. An Ipsen cold-chain transfer mechanism moves the work from the heating zone to the quench zone. The T-300 may be used for a variety of metal-treating operations such as carburizing, normalizing, and stress-relieving.

Semi-Automatic Machine for Processing Steel Oil Pans for Large Diesel Engines

A special-purpose, semi-automatic machine for processing welded-steel oil pans for large Diesel engines has been announced by the Snyder Tool & Engineering Co., Dept. M, 3400 E. Lafayette, Detroit 7, Mich. The operations consist of boring and facing a hand-hole opening at the center line position of each cylinder in oil pans for V-6, V-8, V-12, and V-16 Diesel engines.

The machine base is 267 inches long and 120 inches wide and carries a fixture which is centered on a turntable. The turntable swings the fixture through an arc of 180 degrees to bring the opposite side of the work into the machining position after one side is finished. A hydraulically operated feed unit moves upon rails running the full length of the machine base in front of the turntable. This unit carries the boring and facing tools and is indexed from station to station by a fluid motor which drives a pinion that engages a rack attached to the base.

Operation of the machine starts with loading the work into the fixture and manually clamping it in place. With the carriage at the left-hand end of the ways, the operator presses a button and the hydraulic feed unit goes through its sequence of movements—rapid advance, feed for boring, feed for facing, and rapid return.

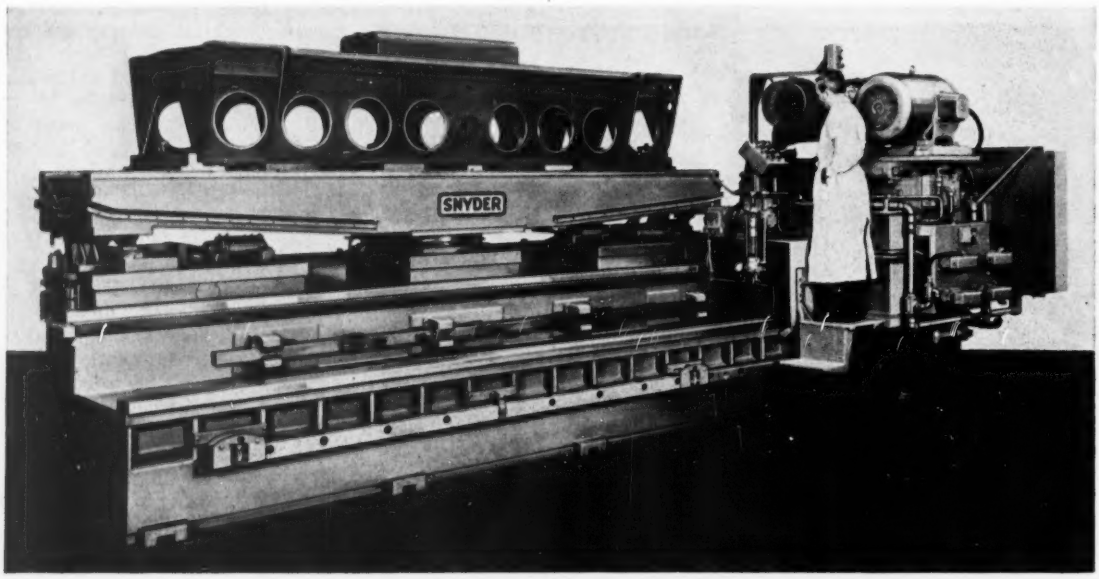
The operator has a choice of automatic or manuel operation. When automatic operation is used, the carriage bearing the unit is indexed to each successive work position and the feed unit goes through its cycle until all holes on one side of the part are bored and faced. The carriage then indexes to the extreme right-hand position shown in the illustration and the operator presses a button, causing the fixture to rotate 180 degrees and bringing the opposite side of the part into position for processing. Pressing the cycle button again causes the carriage to move left to the nearest work station. The unit goes through its cutting cycle and is indexed to each successive station until the work cycle is completed. This brings the unit back to the left-hand end of the machine and the part is unloaded. Dogs for controlling the carriage indexing movements are mounted on a rotating dog rail.

When the machine is set for manual operation, each indexing and cutting cycle is initiated by the operator who must press the respective control buttons. Electrical controls are interlocked so that it is impossible to rotate the fixture unless the carriage is in the clear position. Likewise, the carriage cannot be moved until the fixture is in its proper position.

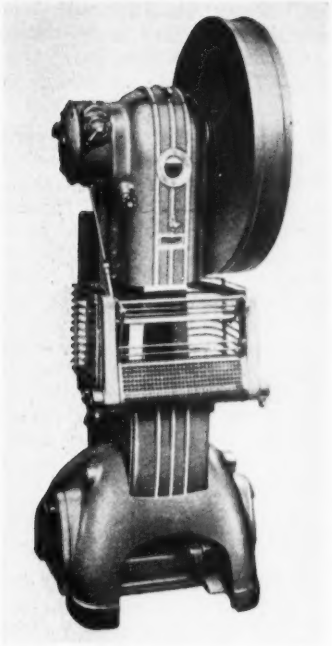
The hydraulic power unit for carriage traverse and head operation is mounted on the moving carriage, and a separate hydraulic unit rotates the fixture. A maximum of sixteen stations can be used. Coolant is pumped from a tank built into the base. Lubrication is from two centralized systems operated by hand. Carbide tools are used.

Press with Self-Contained Power Unit

Morey Machinery Co., Inc., Dept. M, 410 Broome St., New York 13, N. Y., is introducing a "Unit" 15-ton power press of British manufacture. The power unit consists of a complete, self-contained assembly of the press actuating mechanism. The frame is all-steel, welded and annealed to eliminate stresses, and the



Special-purpose semi-automatic machine for processing oil pans for Diesel engines announced by the Snyder Tool & Engineering Co.



"Unit" power press introduced by Morey Machinery Co., Inc.

power unit is heavily keyed to the frame, eliminating the use of obstructive frontal bars. Other features incorporated in this new machine include the total enclosure and submerged oil bathing of all load-carrying surfaces.

The press has selective fingertip control; a clutch interlock; built-in work counter; a ball bearing mounted flywheel; and an oil-immersed multiple-jaw clutch. The stroke is optional in 1/2-inch steps, from 1/2 inch to 2 1/2 inches. Depth of throat, measured from the center line of the slide, is 5 1/4 inches. Safety guards are positively interlocked with the clutch extractor mechanism and remain locked in the closed position during the operating cycle. This press is available in several sizes.

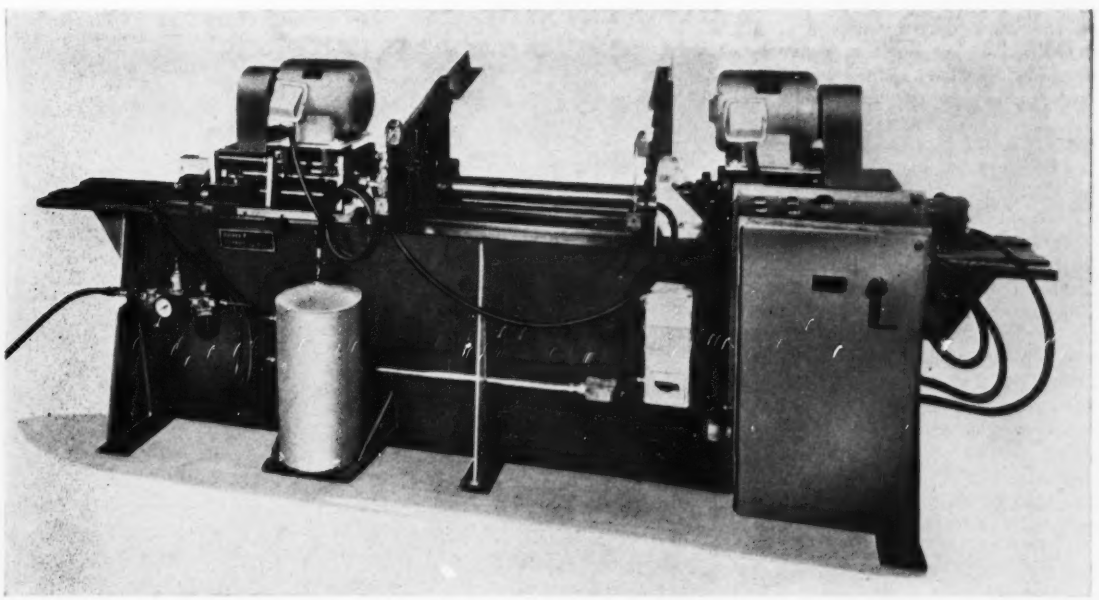
Hill Double-End Boring, Chamfering, and Centering Machines

A line of double-end machines adapted to boring, chamfering, centering, burring, milling, flaring, and spinning operations is announced by Water P. Hill, Inc., Dept. M, 22183 Telegraph Road, Detroit 19, Mich. A production rate in excess of 6000 pieces per hour is said to be made possible by the hydraulic powered magazine feed arrangement and the motorized heads equipped with hydraulic feeds. Spindles incorporated in the heads of these machines are designed to resist unbalanced thrust loads up to 14,000 pounds.

Work-pieces requiring machining operations on both ends are loaded in the magazine from which they are fed one at a time and chucked in a stationary position for machining by the action of a hydraulic cylinder. This cylinder controls the fingers and chuck jaws at each end of the work-holding fixture. Two air cylinders at each end of the fixture act in conjunction with the hydraulic cylinder to provide uniform tension throughout loading and unloading. The power heads rest on flat ways on the machine bed and are adjustable to suit the work length.

When a work-piece is fed into position between the heads, the cutter-spindles are automatically positioned to compensate for part length variations. They are hydraulically fed into depth and retracted. Then the finished part is ejected by the action of the air cylinders as a new part drops into position, thus completing the work cycle. Travel of the cutter-spindles is adjustable up to 6 inches and is accurately controlled by stops.

The machine illustrated performs both internal and external chamfering operations, and faces both ends of 3/16- to 5/8-inch metal tubes from 3 to 40 inches long. An inserted-blade combination tool is mounted in each spindle. Push-buttons control the machine cycle.



Special machine brought out by Walter P. Hill, Inc., for use in the rapid chamfering and facing of the ends of metal tubes

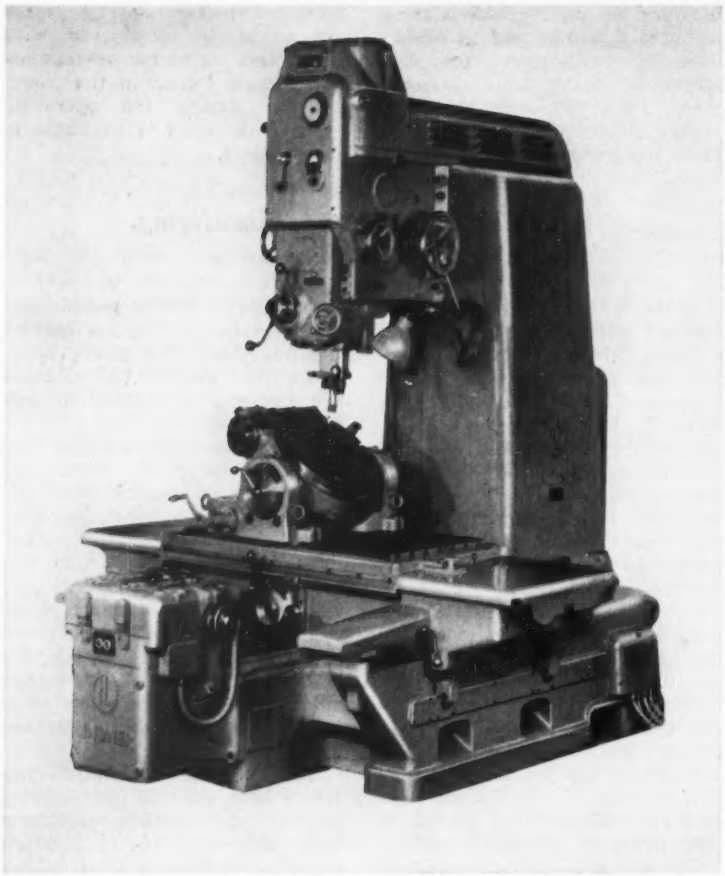


Fig. 1. Lindner jig borer with Autopositioner, distributed in this country by Kurt Orban Co.

Lindner Jig Borer with Autopositioner

Initial settings for precision jig-boring operations can now be made consecutively for each hole in the work-piece by means of a preselective Autopositioner developed by Herbert Lindner. This feature is incorporated in the Model LB15 Lindner jig borer, which is distributed in this country by Kurt Orban Co., Inc., Dept. M, 205 E. 42nd St., New York 17, N. Y.

With the Autopositioner, shown at the front of the machine in Fig. 1 and in the close-up view, Fig. 2, the operator can preselect the table position for the next hole while one boring operation is in progress. An optical projection system of making settings, in conjunction with a photoelectric zero point indicator, permits exact centering. The machine has a table 40 by 24 inches. Table settings are guaranteed to be accurate to 0.00015 inch and it is possible to make readings that are accurate to 0.00005 inch.

Speed and accuracy of the preselected table positioning are made possible by two optical-photoelectric centering devices—one for longitudinal table positioning and the other for transverse positioning. Projection screen *A*, with an integral reticle *B*, shows an image of the desired location line *C* from the cylindrical measuring scale. As this image approaches the reticle, the photoelectric system is energized, and pointer *D* swings in the direction of the optical image. As the image approaches the center of the reticle, the pointer follows its motion. When the image is exactly centered, the pointer also reaches the center position as indicated at *D* in Fig. 2.

One of two methods can be chosen for the preselection of table settings: the coordinate method, in which the positions of all holes are expressed in terms of their distances from a fixed zero point; or the additive method, in which each hole is positioned by its longitudinal and transverse distances from the preceding hole.

In boring two holes in a work-piece which requires one hole to be 2.0042 inches to the right and 1.9749 to the rear of the other hole, the procedure is as follows: First, the work-piece is precisely positioned under the spindle for the boring of a hole at one point *X*. Positioning of the table for the second hole *Y* requires a movement to the left of 2.0042 inches and to the front of 1.9749 inches.

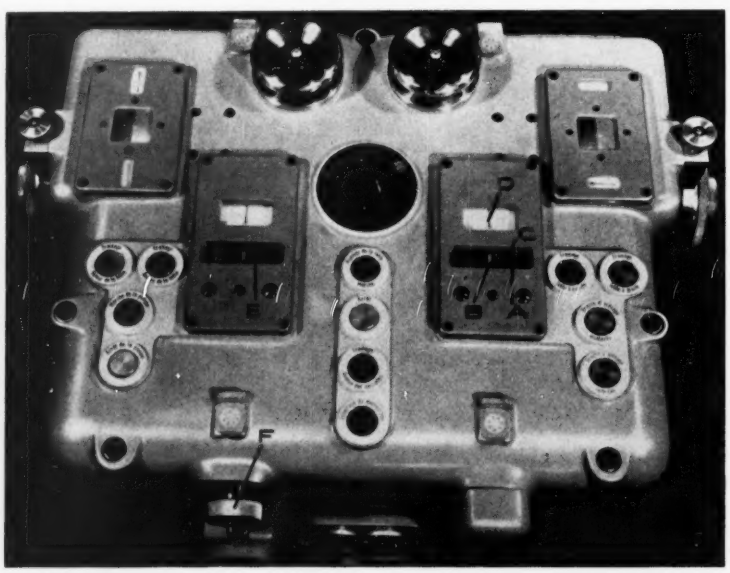


Fig. 2. Autopositioner incorporated in the jig borer shown in Fig. 1

For either the coordinate or the additive method, *X* is taken as the starting point by first setting the drums for the longitudinal and transverse movements at their zero positions by means of their graduated dials and verniers.

The next step is to establish the position of hole *X* as the zero point on the longitudinal and transverse projection screens E and *A* by means of two knobs. One knob is shown at *F*, the other at the right already being protected by a cover.

The graduated drums are then set by means of their verniers to the decimal dimensions of the required longitudinal and transverse movements. Integral inch movements are controlled by the knobs shown near the upper left- and right-hand corners of Fig. 2, and are read on the adjacent preselector dials in inches and to 0.0001 inch.

This completes the preselection process. When the boring operation at point *X* is completed, the operator pushes the start button and the table moves, within very close limits, to the position selected for point *Y*. For exact centering, the operator views the projection screens and photoelectric indicators. Minor adjustments can be made by two handwheels. The same process of preselecting while machining can be repeated for any number of consecutive holes.

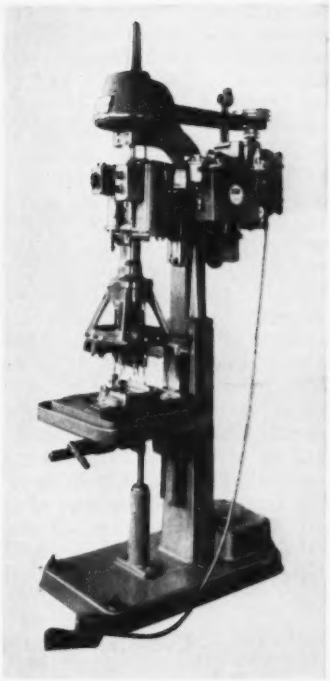
Jig borers incorporating this new Autopositioner will be shown in Booth 2308 at the National Metal Exposition in Cleveland.

Beckett-Harcum Drilling and Tapping Machines

The Beckett-Harcum Co., Inc., Dept. M, Wilmington, Ohio, is now manufacturing a line of heavy-duty "Air Thrust" drilling and tapping machines equipped with an electrically controlled air-powered thrust unit. Two models are available—the C-16 drilling machine and the C-16-T drilling and tapping machine.

The Model C-16-T unit is designed primarily for production multiple drilling and tapping in a wide range of sizes and for handling short-run jobs at high production rates. The sensitive tapping action allows the tap to provide its own lead. Once the tap has entered the work, the only force acting on the tap is rotary torque. When the predetermined depth of stroke is reached, the spindle starts to ascend the instant the motor is reversed and the tap leads out of the work.

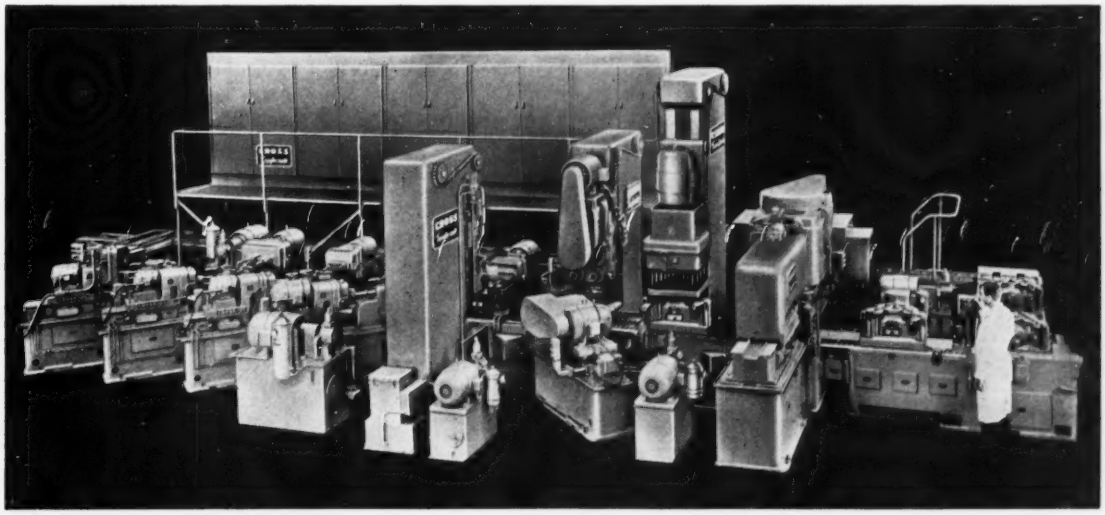
A maximum thrust of 980 pounds at an operating pressure of 100 pounds per square inch is obtainable on these machines. The stroke length is 4 inches, but a 6-inch stroke can be provided. The drilling capacity is 3/4 inch in mild steel, and the Model C-16-T has a capacity for tapping 1-inch National Coarse threads when equipped with a 1-H. P. motor and 1 1/2-inch threads when a 1 1/2-H. P. motor is used. The spindle has a No. 3 Morse taper.



Drilling and tapping machine built by Beckett-Harcum Co.

Cross Special Machine for Processing Exhaust Manifolds

Right- and left-hand V-8 engine exhaust manifolds are completely machined on a "Transfer-matic" type machine tool just announced by The Cross Company, Dept. M, Detroit 7, Mich. With the parts



Exhaust manifold processing machine brought out by The Cross Company

automatically transferred from station to station, the machine performs forty-two milling, drilling, boring, chamfering, and tapping operations at a production rate of 230 (115 right and 115 left) finished manifolds per hour.

The machine has ten stations—one each for loading and unloading; three for milling; three for drilling; one for boring; and one for tapping. Outstanding features include palletized work-holding fixtures with power wrenches for automatic operation; the "Cross-Drive" for milling cutters; and built-in chip conveyor for automatic removal of chips from fixtures. Pre-set tools are used to reduce "down" time and minimize scrap by practically eliminating the trial-and-error method of set-up. The machine has automatic lubrication and is furnished with hardened and ground ways. Hydraulic and electrical installations conform to Joint Industry Conference standards.

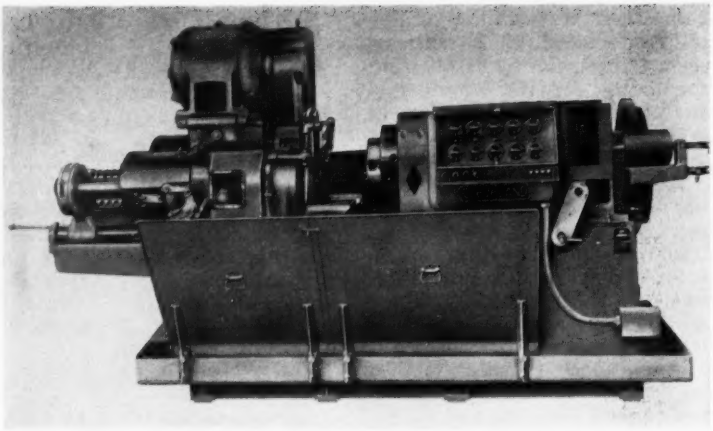


Fig. 1. Cleveland automatic screw machine with dial controlled feed changes for each speed range, made possible through the spindle motor. A hand shift clutch provides two speed ranges for each set of change-gears.

The Meehanite tool turret is 14 inches in diameter and has five turret holes bored in line with the work-spindle. Each turret hole is provided with clamping bushings to hold the tools securely. Smooth, rapid, shock-free indexing is accomplished by the use of a Geneva indexing mechanism. Front and rear cross-slides are independently operated by cam-drums. The draw-in type master collet takes the Cleveland design of quick-change collet pads.

Cleveland Automatic Screw Machines

The Cleveland Automatic Machine Co., Dept. M, Cincinnati 12, Ohio, has added two automatic screw machines to its line, each having a capacity of 4 1/4 inches.

The essential difference between the Model "AB" machine shown in Fig. 1 and the "AW" illustrated in Fig. 2 is in the type of feed drive. The Model "AB" is equipped with an electric feed drive which provides separate, infinitely adjustable forward and return motions for each of the five turret stations. This drive is controlled by ten rheostats and a timing switch. When setting-up, the operator refers to a feed chart which gives the proper dial setting for each rheostat.

The Model "AW" machine has variable forward and return feeds which are obtained through an improved, simplified mechanical drive. An independent motor furnishes the power through a friction-drive unit. Changes of feed, to suit each operation, are automatically controlled by adjustable steel cams on the regulating wheel. Adjustable trip-pins govern the length of feed for each tool.

The spindle head of each machine is accurately machined and securely bolted to the bed. The forged-steel spindle is mounted on Timken precision bearings. The fifty-six spindle speeds available range from 21 to 648 R.P.M. There are four automatic speed

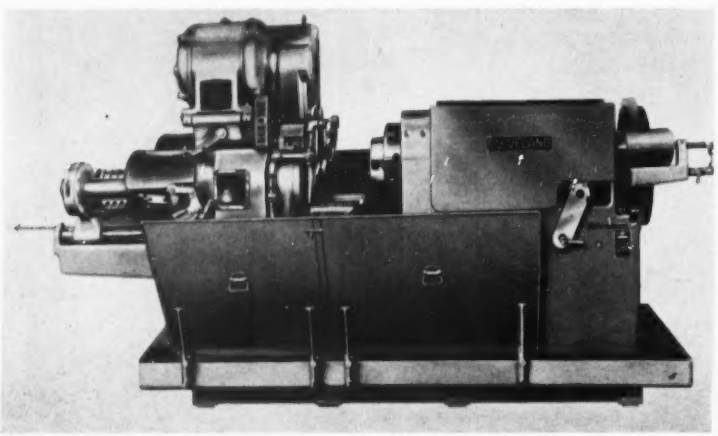


Fig. 2. Cleveland screw machine with simplified mechanical drive

Tool Lubricant for Severe Tapping Operations

A lubricant designated Vantrol 5510B for difficult metal tapping operations has been added to the line of Vantrol lubricants manufactured by the Van Straaten Chemical Co., Dept. M, 546 W. Washington Blvd., Chicago 6, Ill. This lubricant is intended to reduce breakage of taps.

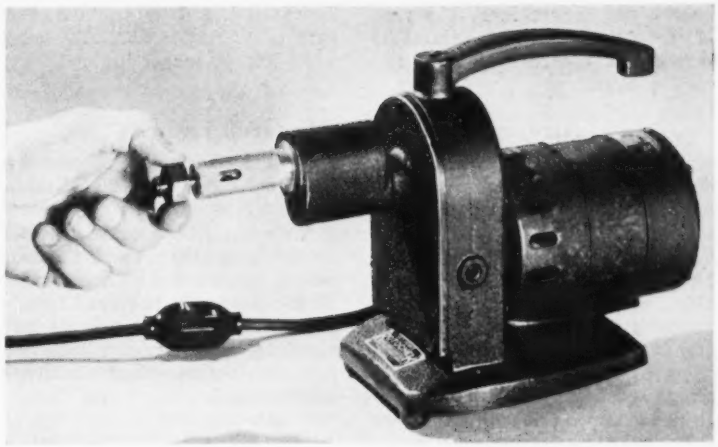
For example, in tapping fourteen to eighteen holes at one time in armor plate castings having a Brinell hardness of 241 to 293 on a multiple tapping machine, excessive tap breakage persisted even though seven different oils, with and without white lead, were tried. Instead of breaking hundreds of taps each week, this job is now being run smoothly as a result of using the Vantrol 5510B compound. Occasionally a tap will break but only one or two taps are broken in a week's operation.

Taft-Peirce Power Thread Gaging Unit

A bench model electrically operated gage for checking internal threads by power instead of manual rotation is announced by the Taft-Peirce Mfg. Co., Dept. M, Woonsocket, R. I. This gage, called the "Rotochek," has the gaging assembly mounted directly on the motor unit.

Work is brought to the unit, a slight forward pressure causing the gaging member to screw into the part automatically at the rate of 4 revolutions per second. Reversal of applied pressure causes immediate disengagement or reversal of the drive, as desired. Torque control is provided by a clutch, to prevent damaging the parts.

The standard spindle will accommodate A.G.D. tapers No. 00, No. 0, No. 1, and No. 2, covering a range of thread gages up to 0.510 inch nominal diameter. A slightly larger spindle assembly can be furnished to extend this range to include A.G.D. No. 3 tapers. Special adapters are also available for reversible thread plug members, and for adapting the Rotochek to inspection of externally threaded parts.



Checking an internal thread with the Rottochek power thread gaging unit brought out by the Taft-Peirce Mfg. Co.

Air-Powered Broaching Fixture

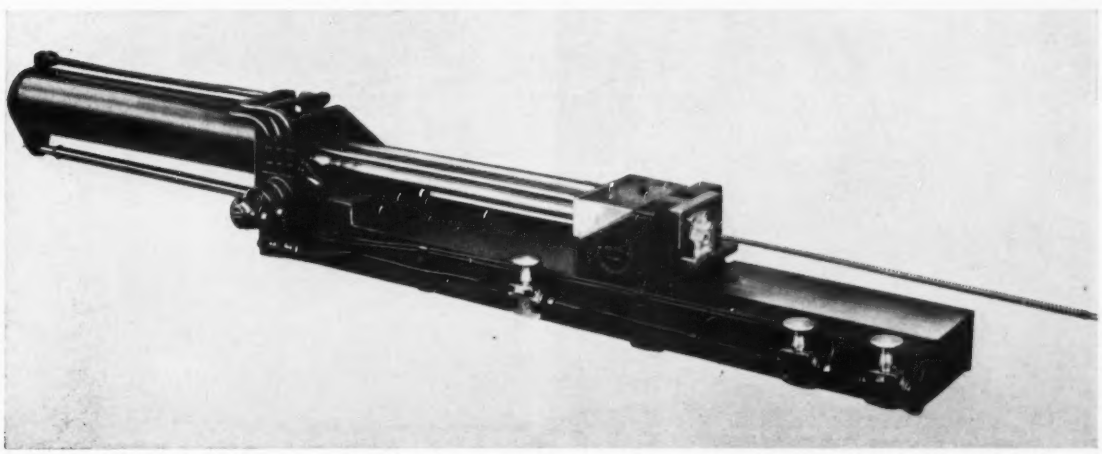
A versatile air-powered broaching fixture designed to cut equipment costs and speed up many broaching operations was recently announced by the National Broach & Machine Co., Dept. M, 5600 St. Jean, Detroit 13, Mich. The horizontal, self-contained fixture will broach holes, keyways, and contours on a wide variety of production parts.

The compact fixture consists of a cast-iron base with two integral vertical flanges. A 5-inch diameter air-hydraulic cylinder having a 25-inch stroke is mounted on a flange at one end of the base. The other flange in the middle of the base supports the work-rest plate. Two hardened and ground steel bars supported by the two flanges guide an automatic broach puller mounted on the end of the air cylinder rod.

Linear ball bushings are provided in the puller-head guide holes to insure long life and reduce friction loads. A four-way valve mounted at the cylinder end of the fixture controls the air cylinder travel through the action of three manually controlled pilot valves.

In operation, a part is placed on the work-rest plate and the broach inserted through the part into the puller. Then pilot valves Nos. 1 and 2 are simultaneously depressed, causing the air cylinder to pull the broach through the part. After the part is removed from the work-rest plate, pilot valves Nos. 1 and 3 are depressed, causing the air cylinder to return the broach through the fixture and release it for removal before repeating the broaching cycle. The cycle time required to rough and finish to close tolerances the valve spool hole in the tractor part illustrated is fifteen seconds.

The fixture has a broach pulling capacity of 1400 pounds at an air-line operating pressure of 80



Air-powered broaching fixture brought out by the National Broach & Machine Co.

pounds per square inch. The rate of broach travel is adjustable through a control valve in the hydraulic end of the cylinder. Fixture is 89 inches long, 12 inches wide, and 10 inches high.

Air-Gage Tracer for Monarch Lathes

A Type C rigid air-age tracer—developed expressly for the Monarch Model EE toolmaker's lathe and Model EE manufacturing lathe—was recently brought out by the Monarch Machine Tool Co., Dept. M, Sidney, Ohio. Greater sensitivity and higher precision standards in the turning of small parts are claimed for the new rigid air-gage tracer. All Model EE machines equipped with this tracer are powered by an electronic drive, resulting in minimum vibration at all speeds due to the absence of rotating elements in the power supply to the drive motor. Maximum diameter change at one setting of the slide is 3 inches.

Conversion of a Monarch lathe equipped with this air-gage tracer to manual operation, or vice versa, can be accomplished in a matter of seconds. The feed range of the hydraulic slide, set at 45 degrees, is such that square shoulders may be turned. Another design feature is the mounting of the tool on its own slide. This can be adjusted for diameter changes without altering the template or tracer setup. Either flat or round templates may be used. The stylus pressure being only 5 or 6 ounces, it is unnecessary to harden the template.

Air and oil lines connecting the tracer with the compact power unit are short. Air at no less than 60 to 65 pounds pressure from a constant pressure source is provided by the user. For this purpose, the regular plant air supply may be used.

Light-Duty Press Brake

The Dreis & Krump Mfg. Co., Dept. M, 7400 S. Loomis Blvd., Chicago 36, Ill., has announced a light-duty press brake known as the Series A. This machine is the latest addition to the "Chicago" line of all-steel press brakes made by the company for bending and forming sheet metal and steel plate.

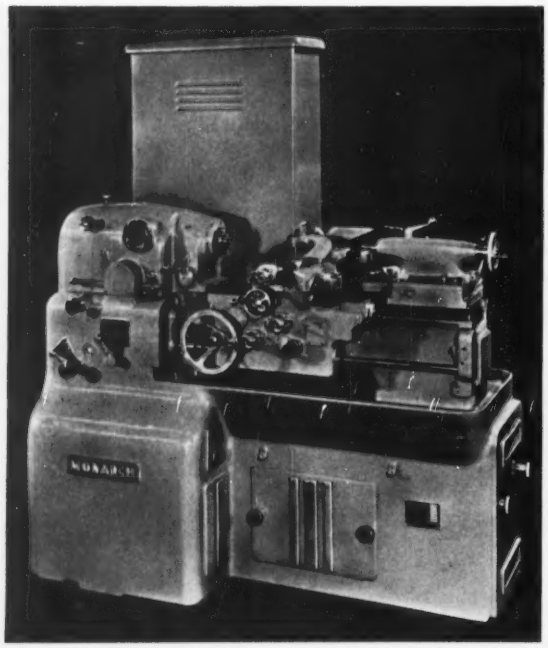
Welded plate construction is used to maintain the original precision alignment of the machine, and a twin-plate bed insures lateral rigidity and minimum deflection. A 1 1/4-inch slug clearance is provided for multiple punching work. A variable-speed drive that is infinitely variable between twenty to fifty strokes per minute is employed.

Uniform application of power over the length of the ram is obtained by a twin drive through a double back-gear. A friction clutch and band brake permit jogging and slipping to meet operating conditions. The motorized ram adjustment can be split so that one end can be raised or lowered to tilt the ram for tapered work.

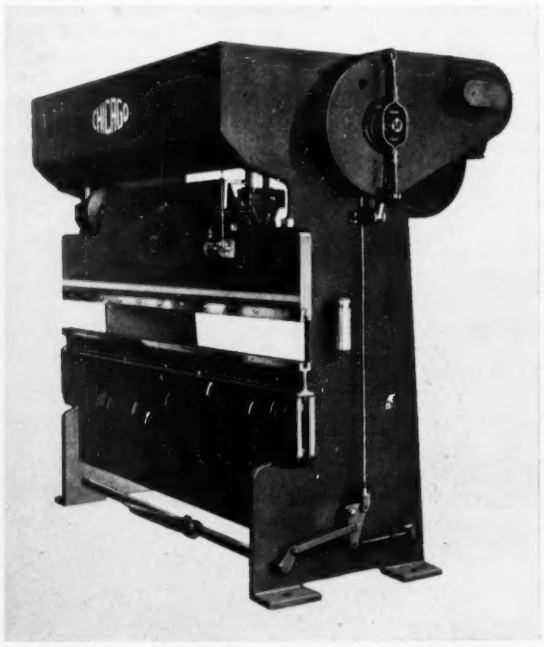
The machine is available in three sizes with capacities for handling sheets and plates from 54 to 120 inches in width and from 10 to 16 gage. Each size has a 3-inch stroke, 3-inch ram adjustment, and 12-inch die space.

Danly Air Control Manifold Valve

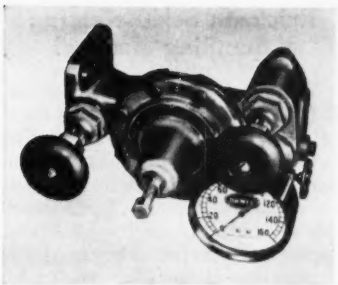
A compact unit consisting of a pressure regulator, with the accessory valves, pressure gage, and fittings normally required to control the pressure in an air line has been introduced by Danly Machine Specialties, Inc., Dept. M, 2100 S. Laramie Ave., Chicago 50, Ill. It is designed for use on mechanical presses to control air pressures on such devices as die cushions, counterbalance cylinders, clutches and brakes, and automa-



Monarch precision manufacturing lathe equipped with the new Type C rigid air-gage tracer



Light-duty press brake placed on the market by the Dreis & Krump Mfg. Co.



Air control manifold valve recently brought out by Danly Machine Specialties, Inc.

tion auxiliaries, as well as for many types of pneumatic circuits that require pressure regulation.

Essentially the unit consists of a globe shut-off valve which admits the compressed air supply; an adjustable pressure regulator; a pressure gage which is protected from line fluctuations by a needle valve; a check valve; and a globe exhaust valve. These are housed in one unit, which is 10 inches from inlet to outlet. Another feature is the use of special headers when more than one manifold is required. This arrangement further reduces pipe fitting and installation costs and permits assembly in a confined space.

Giddings & Lewis High-Speed Milling Attachment

A new type, high-speed milling attachment, designed to machine aluminum-alloy forgings for airplane wing hinge sections, has been announced by the Giddings & Lewis Machine Tool Co., Dept. M, Fond du Lac, Wis. This full swivel Hydro-Drive attachment, was built for the Grumman Aircraft Engineering Corporation, Long Island, N. Y., for use on a Giddings & Lewis table type horizontal boring, drilling, and milling machine. It is said to be especially adapted for machining the many varying angles necessary on the wing hinges.

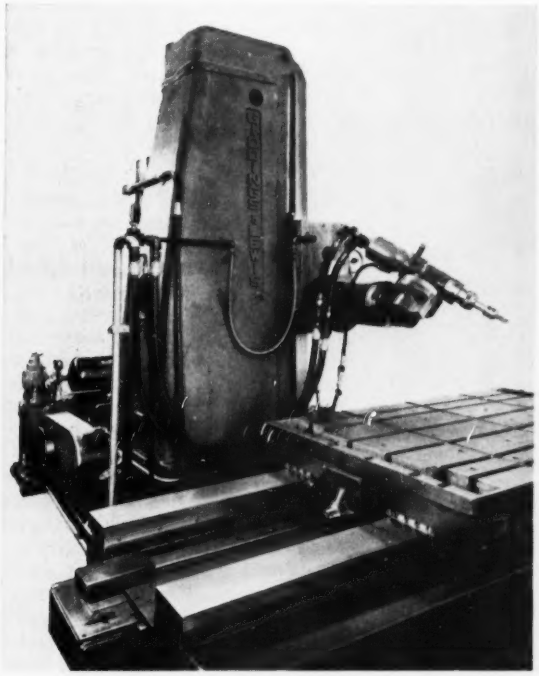
The attachment is independently driven and, having no connection with the machine spindle, does not depend upon any high-inertia driving elements in the headstock of the machine which serves only as a carrier for moving the attachment up and down. The attachment is designed to swivel 360 degrees horizontally and vertically, and has a retractable spindle that provides easy cutter retraction and relocation. A collet at the outer end grips the spindle tightly to insure against vibration and chatter.

This complete high-speed attachment is bolted to the front face of the headstock. Speed control is obtained from a throttle lever on top of a variable-volume pump. Safety overload protection to the cutter and feed motor is incorporated in the design. The attachment has a spindle speed range from 800 to 2400 R.P.M. for machining non-ferrous metals.

Semi-Automatic Milling Machine

A semi-automatic milling machine developed for production milling has been introduced by the Rotex Punch Co., Dept. M, 2350 Alvarado, San Leandro, Calif. Rapid approach to the cutting position, infinitely adjustable cutting speeds, and automatic return of the table to the starting position are features of this rigidly constructed milling machine.

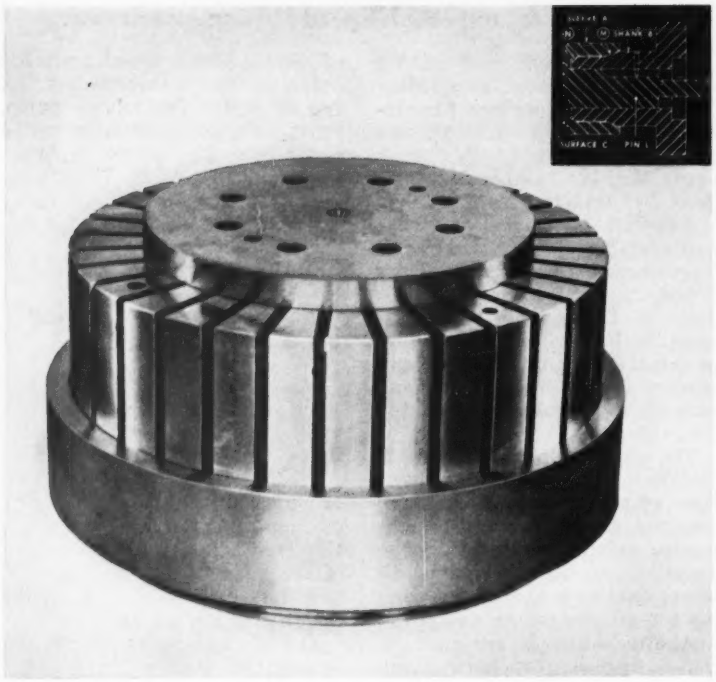
The large-diameter spindle can be supplied with a No. 9 or 10 B & S taper bore, or a No. 4 Morse taper bore. It is equipped with a large Timken bearing and has fifteen speeds. The table can be had with either two or three T-slots milled from the solid metal. All models have Bellows air feed and Hydro-Check units.



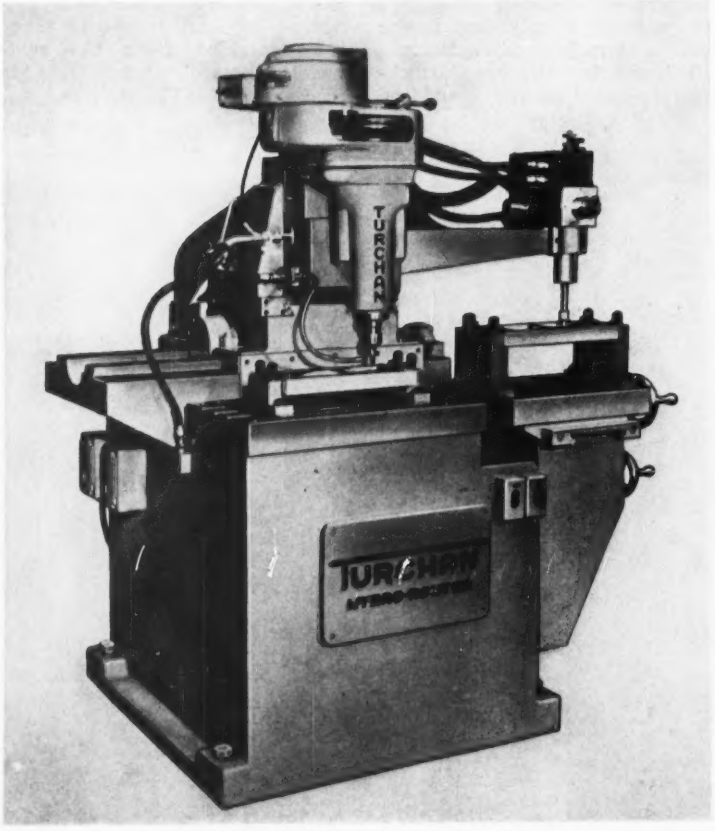
Machine with high-speed milling attachment made by Giddings & Lewis Machine Tool Co.



Rotex semi-automatic milling machine which has been developed for rapid production work



Self-releasing mandrel manufactured by the Erickson Tool Co.



Milling machine with tracer control placed on the market by the Turchan Follower Machine Co.

Erickson Self-Releasing Expanding Mandrel

The Erickson Tool Co., Dept. M, 2319K Hamilton Ave., Cleveland 14, Ohio is manufacturing a line of self-releasing precision expanding mandrels in a wide range of sizes designed to hold work within accuracy limits of 0.0005 inch. The mandrel shown in the illustration is used for work with a 15-inch bore or larger, such as rotors, impellers, and other large, close-tolerance parts. Both larger and smaller mandrels than the one illustrated are in current use. One of the smaller sizes commonly used will handle work with bores or holes ranging from 1/2 to 5/8 inch in diameter.

The gripping and releasing principle on which the mandrels operate is shown in the diagram in the upper right-hand corner of the illustration. The cam surfaces *M* and *N* of the slotted sleeve *A* mate with corresponding surfaces of the shank within accuracy limits of 0.0001 inch. When pin *L* is drawn back against surface *C*, *A* expands equally or uniformly over its entire length. Some of these mandrels are so designed that a lock-nut applies the expanding pressure in place of pin *L*. The mandrels immediately release the work when the actuating force is withdrawn. Each Erickson sleeve expands over a range of 1/32 inch and each shank accommodates a number of sleeve sizes. Thus, each mandrel is usable for a large variety of work. Sleeves for the mandrels can be machined to fit splines, under-cuts, threads, and other internal contours.

Automatic Tracer-Controlled Milling Machine

An automatic tracer-controlled milling and routing machine is being placed on the market by the Turchan Follower Machine Co., Dept. M, 8259 Livernois Ave., Detroit 4, Mich. The Turchan Hydro-Router of this machine is built for rapid handling of difficult precision work and quick change-over from one job to another. Finger-tip operation is accomplished through hydraulic tracer servo-control. This control provides for accurate positioning of the vertical spindle slide, ram, and ram slide. With this equipment, the tool can be made to reproduce the same form on the work as that of

the master with which the tracer stylus is in contact.

All hydraulic feeds of the machine have infinitely variable feed rates with stepless automatic tracer control developed to produce a fine surface finish. The worktable is attached to a sturdy machine base. The master table can be accurately adjusted by controls. Micrometer dials facilitate set-ups and rapid handling.

The Hydro-Router is available in several models. Model 1-24, illustrated, is the smallest. The table has a working surface 32 1/2 by 14 1/2 inches, a longitudinal movement of 24 inches, crosswise movement of 12 inches, and vertical travel of 8 inches. All feeds are infinitely adjustable from 0 to 65 inches per minute. Spindle speeds range from 900 to 3600 R.P.M.

Leitz Amplifying Gage

The George Scherr Co., Dept. M, 200 Lafayette St., New York 12, N. Y., is introducing in this country an amplifying gage of unusual design combining both optical and mechanical principles. In this gage, called the "Leitz Opti-Comparitol," a beam of light from a low-voltage lamp projects an index mark against a tilting mirror with a fulcrum that gives any movement of the contact tip an initial magnification of 4 to 1.

The index mark is reflected against a mirror that redirects the beam of light and the index mark against a long translucent screen, resulting in a total amplification on the scale of 1000 to 1. The instrument is set up with either a master or gage-block, and the work-pieces are passed under the contact tip showing their variations, if any, on the screen against a brightly illuminated background. Over-size parts are indicated by the color green and under-size parts by red.

The dial has 0.00005-inch graduations and a range of 0.005 inch. A unique advantage claimed for the "Opti-Comparitol" is that the full range, covering 0.005 inch, is divided into 100 wide graduations.

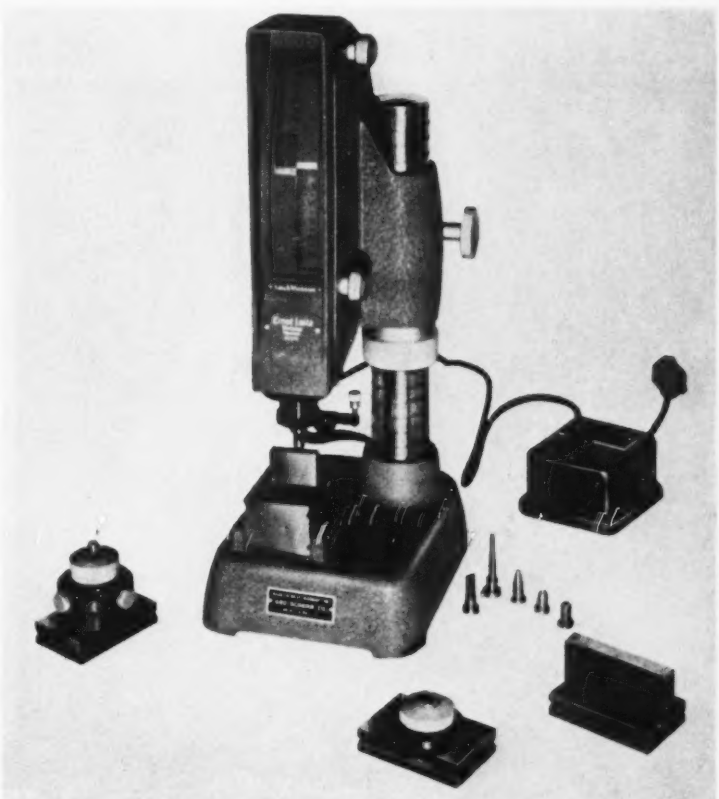
The instrument is said to give uniform repeat readings by skilled or unskilled hands alike, since the human element is completely eliminated. The gage will take work up to 6 inches in diameter. A variety of anvils, contact tips, and backstops, some of which are shown in the illustration, is available.



Granite lay-out plate brought out by the Bryant Chucking Grinder Co.

Bryant Granite Surface Plates

The Bryant Chucking Grinder Co., Dept. M, Springfield, Vt., has brought out a line of granite surface plates designed for use as reference plates in layout, inspection, and assembly work. These surface plates are made of granite from the Rock of Ages quarry in

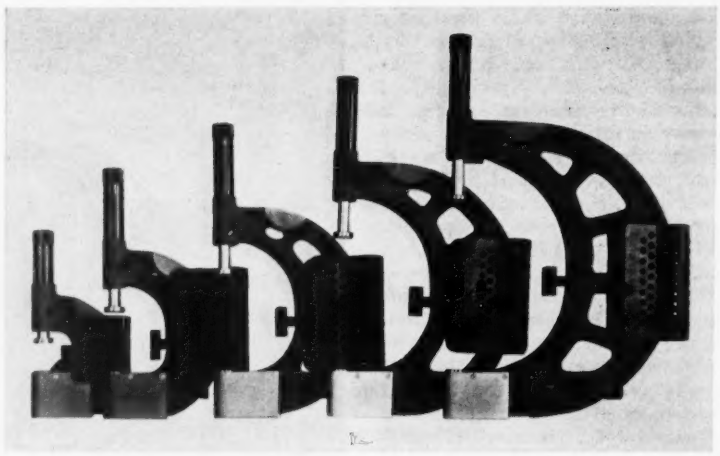


Amplifying gage introduced in this country by the George Scherr Co.

Barre, Vt. The granite is noted for its exceptionally close-knit composition, texture, and color tone, qualities which are especially suited to fine surface plate application. The stone is finished on the "head of the grain" by a patented process. Advantages claimed for these surface plates include utmost precision of surface, lasting accuracy, and low initial cost.

Federal Contact Type Air Snap Gage

An adjustable air snap gage introduced by the Federal Products Corporation, Dept. M, 1144 Eddy St., Providence 1, R. I., differs from other air snap gages in that it is a contact type gage. This means that the work-piece is positioned directly on the flat, tungsten carbide gage anvils. With this arrangement, the user can tell by the feel when the piece is correctly positioned in the gaging head. The air jet does not contact the work-piece but instead is located in the sensitive anvil assembly. The frictionless movement of this anvil is read on the dial of a Federal "Dimensionair" gage, which gives a direct reading to the nearest 0.00005 inch.



Contact type air snap gages brought out by Federal Products Corporation

The wide adjustment of this air snap gage makes it possible to cover a measuring capacity range from 0 to 6 inches with only five gages. An unusually large amount of overtravel protects the gage from jamming caused by over-size parts, and an insulating handle eliminates the chance of error through heat transfer from the operator's hand. According to the manufacturer, the gage is characterized by exceptional accuracy and sensitivity combined with speed of operation. Also, being very thin, it can easily measure between narrow shoulders.



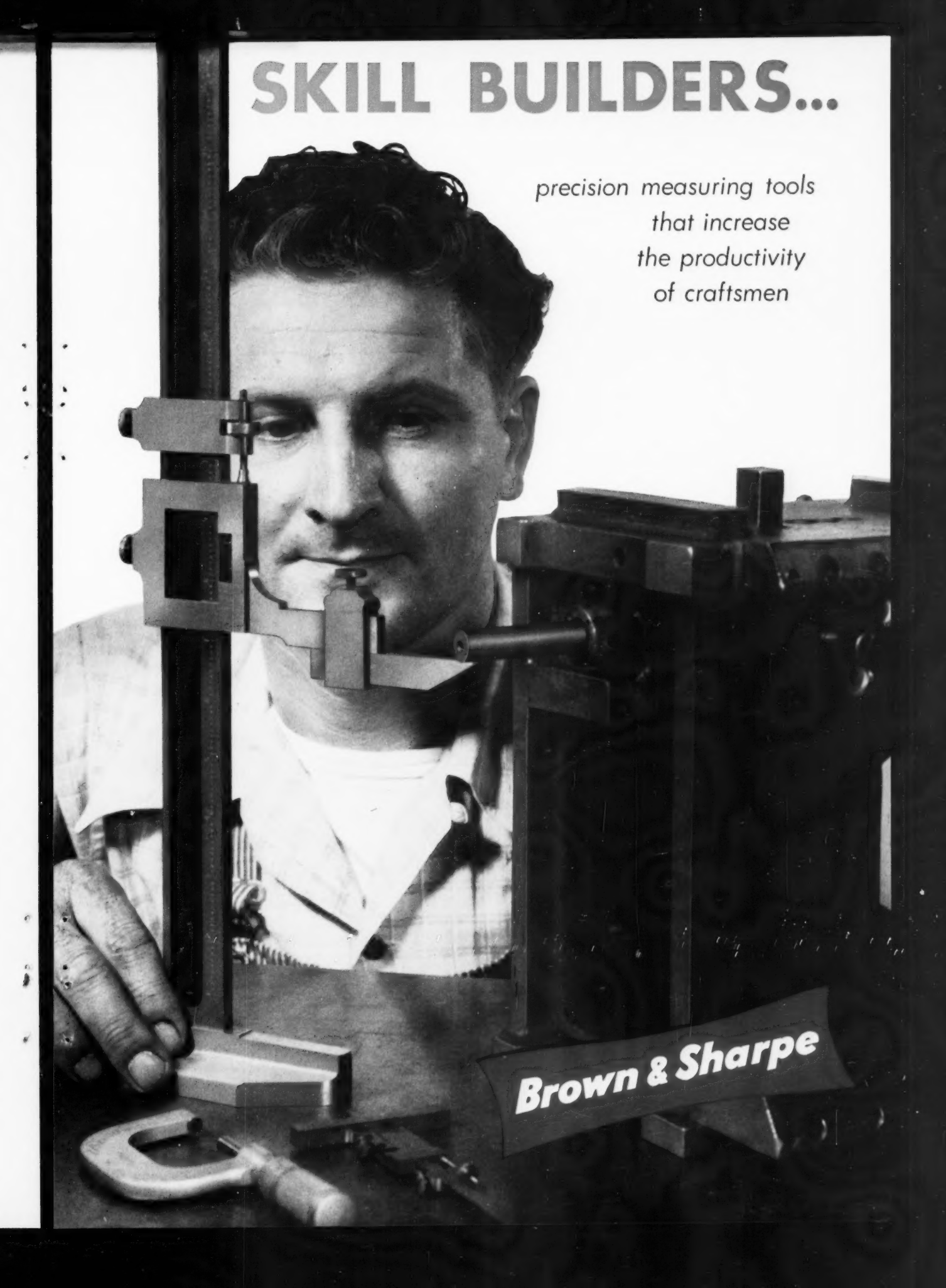
Sheffield "Multichek" for inspecting driving-shaft bearings

"Multichek" Gage for Inspecting Five Diameters on Shaft Simultaneously

A multiple gage or "Multichek" that inspects five bearing diameters on a drive-shaft simultaneously, and indicates by means of lights whether or not the dimensions are within tolerance specifications, over-size, or under-size, is a product of the Sheffield Corporation, Dept. M, Dayton 1, Ohio. This gage is equipped with three "Airlectric" gage heads for checking dimensions within 0.0001 inch and two "Electrichek" gage heads for checking within 0.001 inch. Shafts can be inspected on this precision instrument at a rate of 600 to 800 per hour.

Minimum and maximum masters are used in setting up this gage and no special skills are required in its use. The operator places the part in the positioning fixture and slides the fixture forward into the gaging position. When all dimensions are within the preset tolerance, the master light remains lighted and the five signal lights go out. However, if one or more of the dimensions are outside the tolerance limits, the master light turns red and individual red or green signal lights indicate whether the part gaged is under-size or over-size. When all dimensions are correct, the lights go out.

(*This section continued on page* 237)


SKILL BUILDERS...
precision measuring tools
that increase
the productivity
of craftsmen
Brown & Sharpe

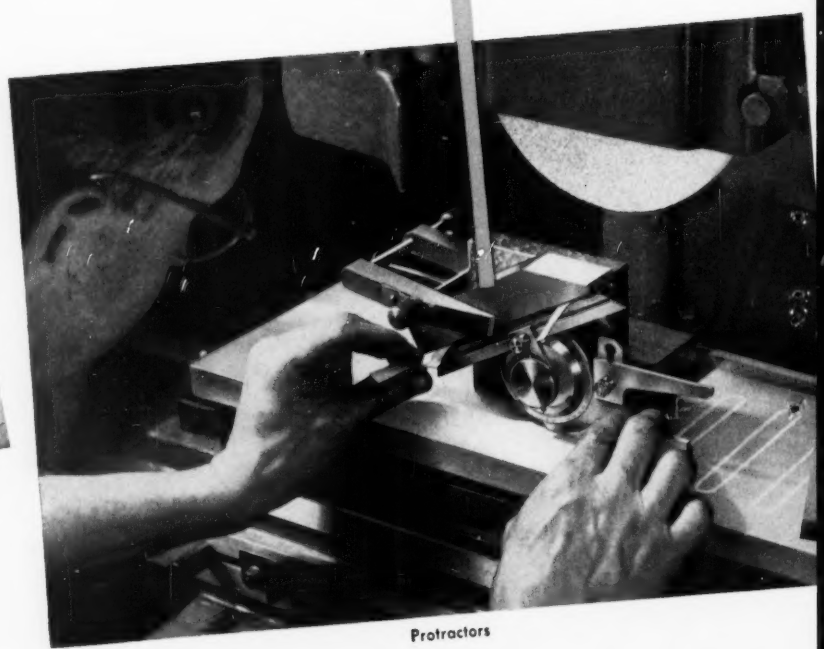
These Tools Create Confidence... make craftsmen more skillful



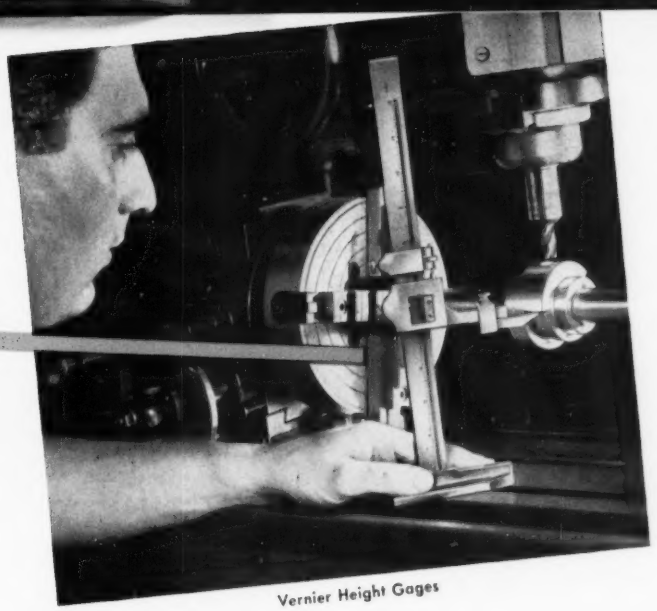
Micrometers



"Intrimik" Internal Tri-point Micrometers



Protractors



Vernier Height Gages

Throughout the metalworking industry, Brown & Sharpe Precision Measuring Tools command a respect and confidence which are reflected in greater accuracy and increased output of your precision products. That's why it pays you to invest in these quality tools. Craftsmen know that all Brown & Sharpe Products are conscientiously made "with the intention that they shall be the best in their respective classes".
The complete line of Brown & Sharpe Machinists' Tools is fully described in the new Catalog 35M. Write for your copy.

Brown & Sharpe

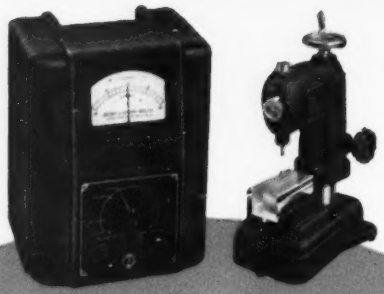


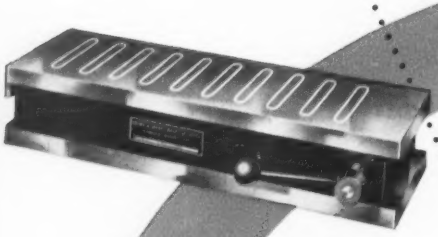
Dial Test Indicators



Vernier Calipers

Buy through your local Distributor







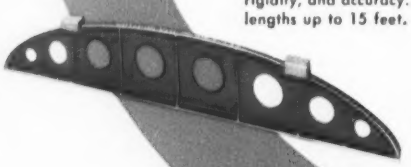
Electronic Measuring and Inspecting Equipment — continuously variable magnification with readings from .0001" to .00001". Amplifier separate from measuring units assures readings unaffected by amplifier heat. Stock and special external or internal measuring devices available for use with amplifier.

Permanent Magnet Chucks — work holding short-cut. Completely safe and portable. No electrical connections . . . hold work securely even when plant power fails. Wide choice of rectangular and rotary models.

Cast Iron Surface Plates — made from a uniformly hard iron, hand scraped to give you a true reference surface on which tools will slide smoothly and easily. Wide range of sizes.

Vital Shop Equipment for Increased Output of Precision Products

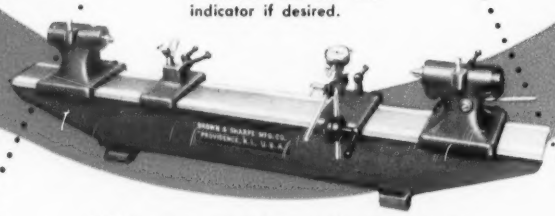
Cast Iron Straight Edges — long, narrow testing surfaces of great strength, rigidity, and accuracy. In lengths up to 15 feet.



Ground Flat Stock — Brown & Sharpe offers a choice of oil or water hardening types in 16 different thicknesses, from 1/64" to 1".



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Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

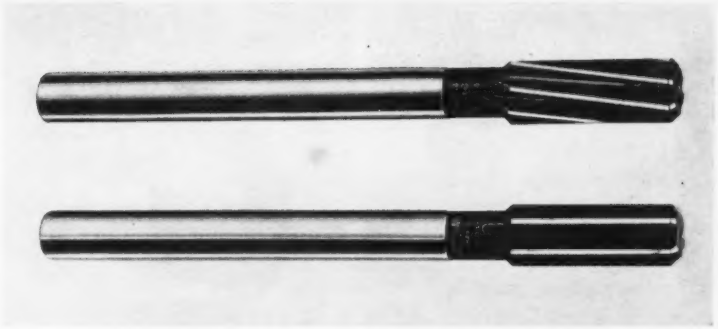
Printed in U.S.A.

Burgmaster Six-Spindle Automatic Turret Drill

The Burg Tool Mfg. Co., Dept. M, 3743 Durango Ave., Los Angeles 34, Calif., has announced a series of Burgmaster universal type production machines designed to cut costs on second operation work in small-job lots as well as quantity production work. The outstanding feature of this Model 2BH machine is the infinitely variable hydraulic feed which can be manually controlled for automatic operations. One operator can attend to several machines at the same time.

Infinitely variable feeds and twelve pre-selective spindle speeds are available for each spindle. Precision double ball-bearing spindles insure long, troublefree, and smooth operation. A worktable with a travel of 19 inches allows large or small parts to be handled. Positive depth stops of the pre-selective type are provided for each spindle.

The normal cycle consists of rapid traverse to predetermined point, feed to depth, and rapid traverse away from work. Skip indexing can be employed to eliminate loss of time when four or five tools are used.



Whitman & Barnes straight and spiral flute reamers with straight shanks

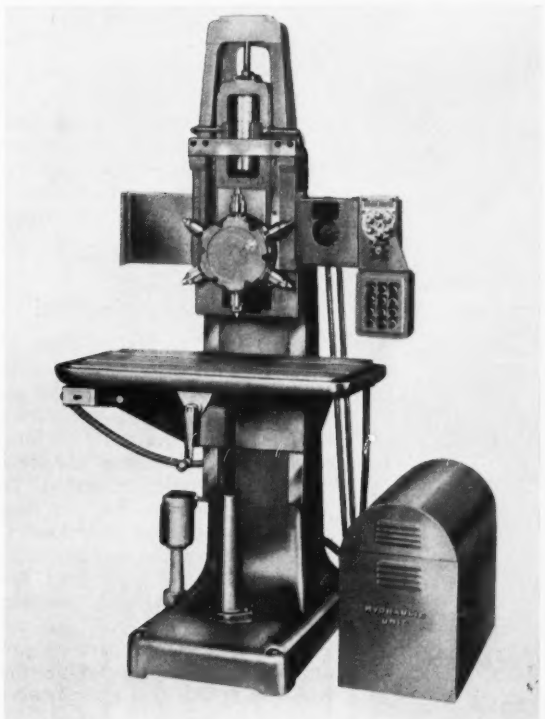
Whitman & Barnes Straight Shank Reamers

Whitman & Barnes, Dept. M, Plymouth, Mich., have recently added new sizes to their line of chucking reamers—both straight shank, straight flute and straight shank, spiral flute types.

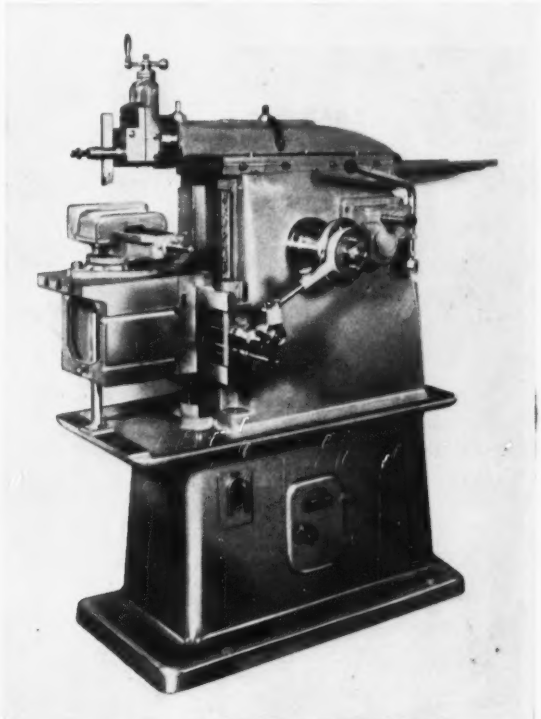
The straight flute reamer is now available in sizes increasing in steps of 1/64 inch from 3/64 to 31/64 inch, inclusive, and in wire gage sizes from No. 1 to No. 60, inclusive. Letter sizes range from A to Z, inclusive. Fourteen decimal sizes range from 0.12 to 0.501 inch. The spiral flute type is made in sizes that increase in steps of 1/64 inch from 5/64 to 31/64 inch, inclusive.

Shaper for Tool-Room and Production Work

The Austin Industrial Corporation, Dept. M, Box 430, White Plains, N. Y., is now distributing in this country Prema 10-, 11-, and 13-inch stroke shapers. These are precision tool-room machines, yet built ruggedly enough for production line use on work with-



Burgmaster universal type six-spindle automatic turret drill



Prema shaper introduced by Austin Industrial Corporation



Fig. 1. Series 7500 double-sealed bearing designed with no extension on inner race



Fig. 2. Series 7600 double-sealed bearing with extended inner race and two set-screws

in their capacities. The drive is by V-belt through a quick-acting friction clutch from a 2-H. P. motor, manufactured especially for service in the United States. The motor is fully enclosed within the machine column. A range of six ram speeds, from 30 to 150 strokes per minute, and six power feeds are provided.

Among the features are hardened alloy-steel gearing, antifriction bearings on all shafts, nd hand scraped slides.

Sealed Solid Race Type Ball Bearings

The Nice Ball Bearing Co., Dept. M., Nicetown, Philadelphia, 40 Pa., is placing on the market the 7500 and 7600 series of precision radial bearings. They are a Single row, solid race type bearing with ball retainer and labyrinth seal. Both series are available with or without a snap-ring. Normally double-sealed, they can be made to order with seals on one side only, or without seals. They are designed for medium loads and speeds up to 5000 R. P. M.

"Fullanchor" Wheel Brush

A wheel brush called the "Fullanchor," filled with wire of oil-tempered, high-tensile, crimped or stainless steel, brass, or nickel, has been brought out by the Fuller Brush Co., Industrial Division, Dept. M, Hartford 2, Conn. The brushes can be used off-hand; mounted on flexible shafts; fixed on brushing machines, lathes, etc.

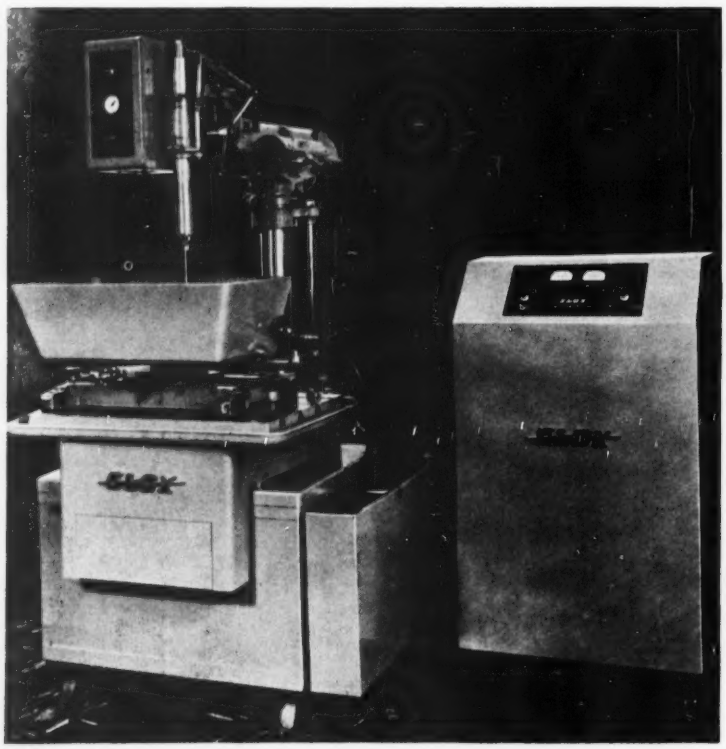


"Fullanchor" wheel brush

Shifting of the fill material at high speeds is prevented by the staple anchoring system, since each filament is looped under the staple to prevent its pulling out. As the trim wears down, smaller side-plates can be used to expose new length of trim.

Elox Electronic Drill

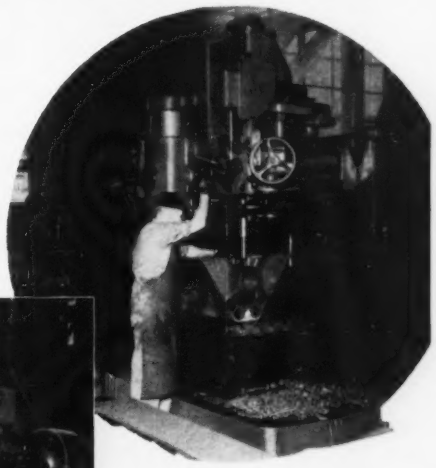
The Elox Corporation, Dept. M, 740 N. Rochester Road, Clawson, Mich., will exhibit its newest development in the field of electrical discharge or electronic drilling machinery at the Cleveland Metal Show. This machine called the M-400, is said to be the most powerful of its kind. As shown in the illustration, the equipment includes a power supply unit specifically engineered for precision tool and die work. Shaped and round holes can be accurately produced in tungsten carbide and tool steels with this equipment.

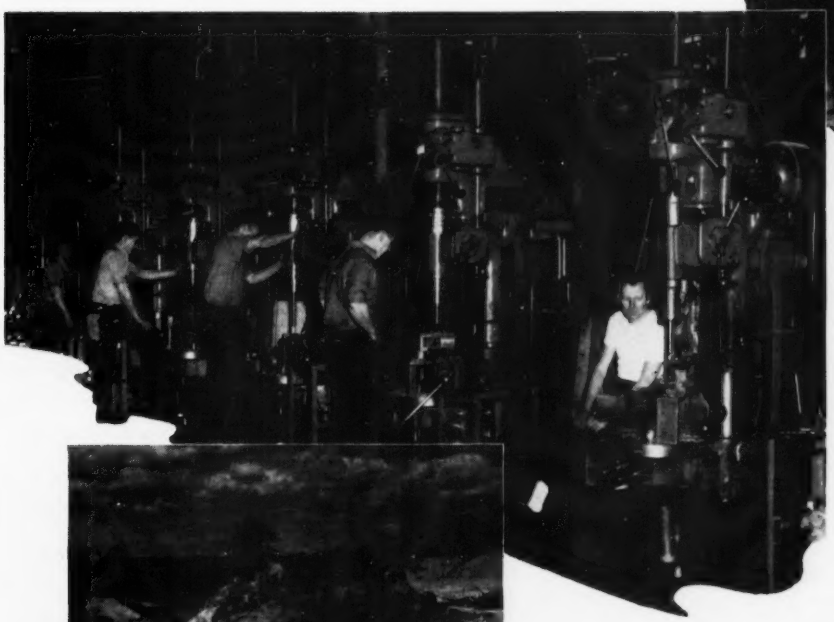


Elox electronic drilling equipment of improved design

It's CINCINNATI BICKFORD

at Bay City Shovels, Inc.





Cincinnati Bickford Super Service Radial drilling equalizer support for torque rods and rocker arms.



Photos courtesy—
Bay City Shovels, Inc., Bay City, Michigan

25 years ago Bay City Shovels, Inc., bought its first Cincinnati Bickford Drill. Today high speed drilling in tough alloy steels—(in the manufacture of sturdy Bay City Shovels) is being done by a battery of eleven Cincinnati Bickford Radials and upright Drills. For example, one of these Super Service Radial Drills has increased production on power crane and shovel revolving bases by cutting floor to floor time from 6½ hours to 4¼ hours. Production of the smaller parts is being speeded by the all-geared upright drills.

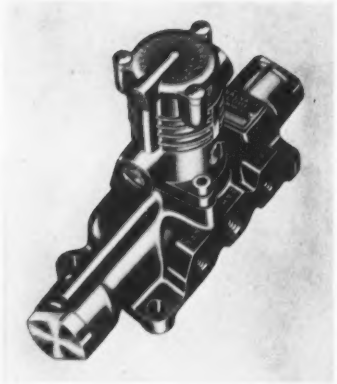
Write for Bulletins covering Radial and Upright Drills.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

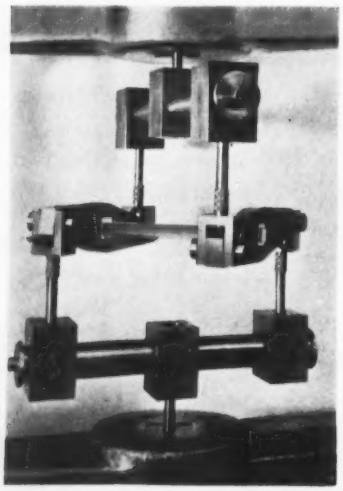


Air Control Valve

Solenoid-actuated pilot-operated air control valve of line brought out by the Valvair Corporation, Dept. M, Morgan Ave., Akron 11, Ohio. This valve is available in three-way, four-way, and four-way five-port (two-pressure) types for pipe sizes from 1/4 to 1 inch for foot base mounting or sub-base manifold mounting. The valve parts are non-corrosive and totally enclosed to provide dust-proof and splashproof protection. All models can be used for air pressure from 35 to 150 pounds per square inch and for low-pressure oil hydraulic service.

Torsion Test Device

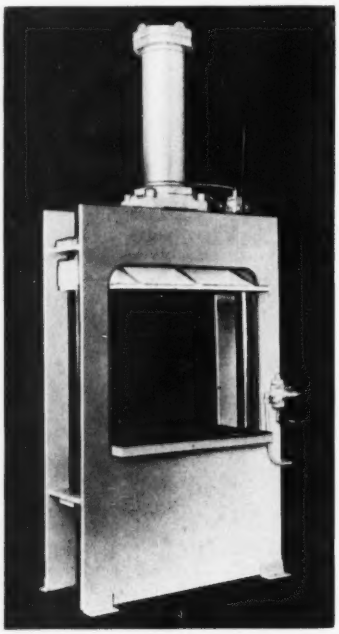
Test specimens up to 3/4 inch square and ranging from 2 to 12 inches long (plus 2 inches for torque bar engagement) can be twisted to a maximum angle of 24 degrees by the Schaevitz torsion device announced by the Baldwin-Lima-Hamilton Corporation, Dept. M, Philadelphia 42, Pa.



The device is designed to apply a purely torsional load when used on a tension testing machine. The maximum torque load is 60,000 inch-pounds, obtained by applying a 12,000-pound tension load. The Schaevitz device is furnished with hardened socket liners for specimens 3/8, 1/2, 5/8, and 3/4 inch square, or for round specimens with square ends in these sizes. Other sizes of liners are available on order.

Hydraulic Compression Press

A 50-ton capacity compression press providing a 24- by 36-inch platen and a 30-inch stroke has been developed by Sheridan-Gray, Inc., Dept. M, 405 Via Chico, Palos Verdes Estates, Calif. A frame design of low cost gives ample strength without sacrificing accuracy. These presses can be operated singly or in multiple from a central hydraulic power supply. Air-hydraulic power units are also available. Manual or automatic controls are optional.



Black Granite Lay-Out Plate

Black granite lay-out plates of a line supplementing the surface plates manufactured by the Collins Microflat Co., Dept. M, 2326 E. 8th St., Los Angeles 21, Calif. The lay-out models do not have clamping edges, but are straight-sided. By eliminating sawing of edges for clamping purposes and allowing a larger tolerance, it is possible to produce the lay-out plates at a lower cost than surface plates. The surfaces of the lay-out plates are finished to an accuracy of 0.0002 inch per foot. The lay-out plates are made in sizes ranging from 12 by 18 up to 36 by 48 inches.



Redesigned Alternating-Current Welder

Alternating-current welder of improved design now available in 300- and 500-ampere sizes from the Metal & Thermit Corporation, Dept. M, 100 E. 42nd St., New York 17, N. Y. Improvements include new cases or housings and a range switch that requires no changing of leads or connections. A primary switch at the welder permits turning off the current between welds. An adequate supply of air for cooling all parts of the unit is provided by a fan.



Users report excellent results with New Sunicut S Oils

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AN AUTO PARTS MANUFACTURER INFORMS US, "Threaded parts are as much as 50° cooler when they come off the machines. And our operators like the clear, clean, odorless qualities of Sunicut 102-S."

SCREW MACHINE SHOPS REPORT, "The versatility of Sunicut 209-S permits us to reduce the number of oils we must stock."

BROWN & SHARPE SCREW MACHINE OPERATORS SAY, "Sunicut 11-S increases tool life, gives finer finishes, eliminates staining problem."

LARGE IMPLEMENT MANUFACTURER TELLS US, "We get better finishes in our broaching operations with Sunicut 110-S, and our operators favor its light color."

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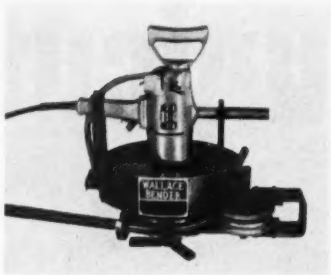


Metallizing Nozzle Requires No Manual Adjustment

Improved metallizing machine incorporating a new nozzle marketed by the Vandersee Engineering Co., Inc., Dept. M, 727 W. 7th St., Los Angeles, Calif. The nozzle eliminates the need for manual adjustments by the operator, and assures an even flow of metal to the surface being metallized. The bearings for the wire feed mechanism are encased in the main body gear case casting, giving improved gear alignment and easy access for repair. The gas mixing chamber is built in the nozzle at the point of combustion.

Wallace Portable Power Bending Machine

The Wallace No. 60 bending machine, powered by a special reversible 3/4-H.P. portable drill motor, has been placed on the market by Wallace Supplies Mfg. Co., Dept. M, 1300 Diversey Parkway, Chicago 14, Ill. Die forms may be quickly changed to accommodate 1/2-inch and 1 1/4-inch IPS pipe in bends up to 180 degrees. The machine is of all-steel, arc-welded construction with a casehardened and ground main driving gear. Limit switches are set for 0- and 180-degree rotation of bending form to prevent the possibility of overtravel in either a forward or reverse direction. The bender is designed to



be placed anywhere along a length of pipe and operated at that location. An average of sixty bends an hour may be obtained by a single operator.

Special Thriftmaster Universal Joint Drill Head

A 16-spindle adjustable drill head has been built for drilling trowel handles having in-line holes with centers varying from model to



model. The head illustrated, in which the spindles may be adjusted to within a 1 1/2-inch radius of their respective driving points, has a 1/4-inch drilling capacity in cast iron. This unit is built by the Thriftmaster Products Corporation, Dept. M, 1014 N. Plum St., Lancaster, Pa.

Black Granite Surface Angle-Plate

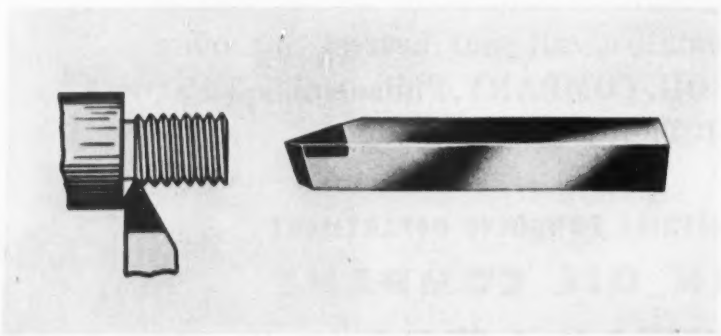
Surface angle-plate combination developed by the Rahn Granite Surface Plate Co., Dept. M, 641



N. Western Ave., Dayton 7, Ohio. Due to the inherent stability of the black granite, the unit has precision. A flatness tolerance of 0.00005 inch is maintained on all three surface plates in the combination. They are finished so that the two angle-plates lie within 0.0001 inch of a plane of 90 degrees with the plane of the surface plate.

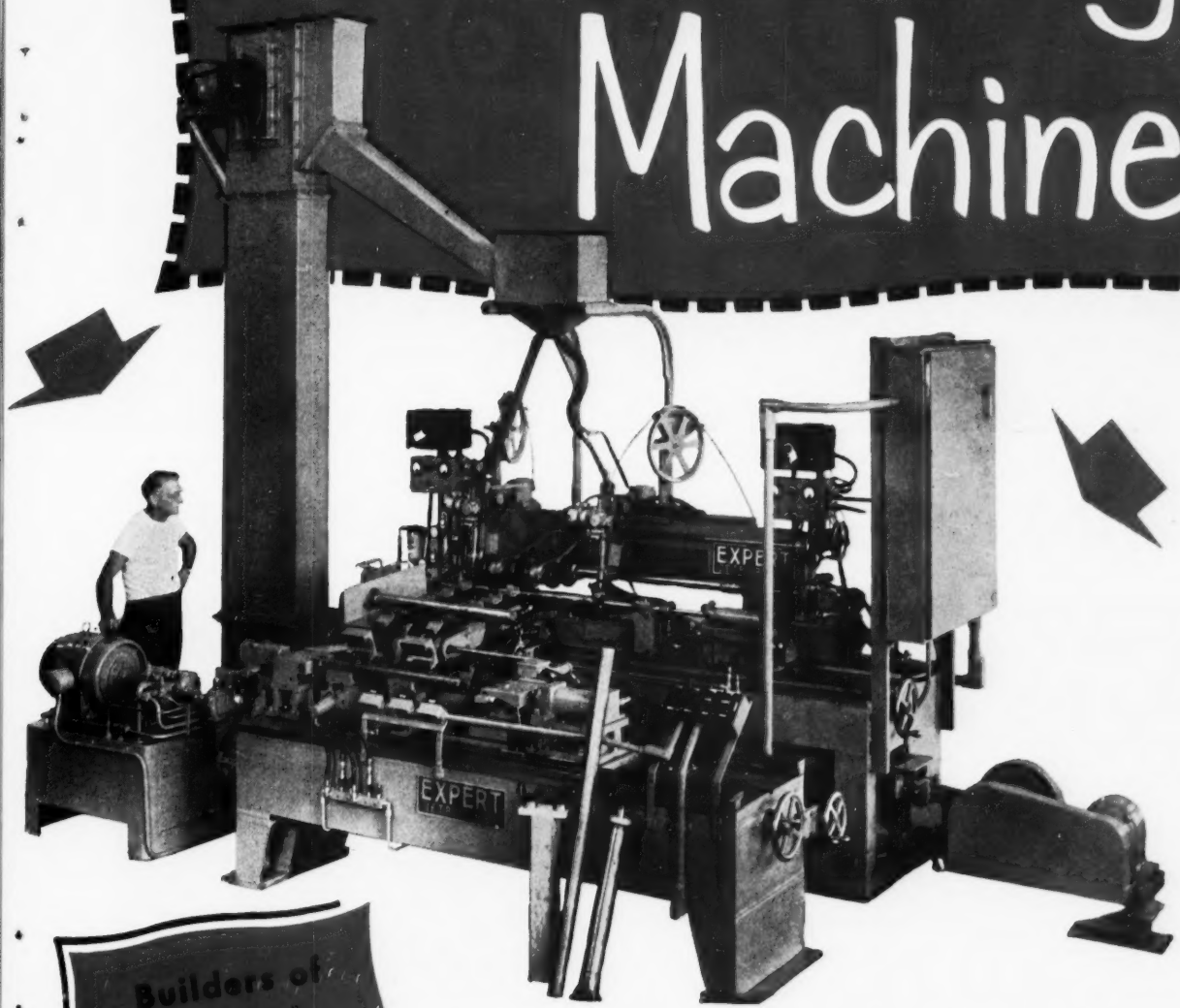
Carbide Off-Center Threading Tool

Off-center threading tool added to line of standard carbide-tipped tools produced by the Super Tool Co. Dept. M, 21650 Hoover Road, Detroit 13, Mich. This tool, identified as Type ETS, provides for 60-degree threading of work closer to the shoulder than with conventional tools. It is available from stock in seven sizes, with shanks ranging from 3/16 to 3/4 inch in diameter.



AUTOMATIC SUBMERGED

Arc Welding Machine



Builders of SPECIAL MACHINES for EVERY PURPOSE

This specially designed machine welds Universal Fittings and Splines into fifteen various length Propeller Shafts . . . Included in the unit is a press for fitting the yoke into the tube prior to being conveyed into a welding position.

FOR FURTHER INFORMATION CONTACT

EXPERT WELDING MACHINE CO.

17144 MT. ELLIOTT AVE. • DETROIT 12, MICH. • PHONE TWINBROOK 1-4327



For the long haul... Autocar relies on RB&W bolts

Famous truck builder rates them best for ease of assembly and accessibility

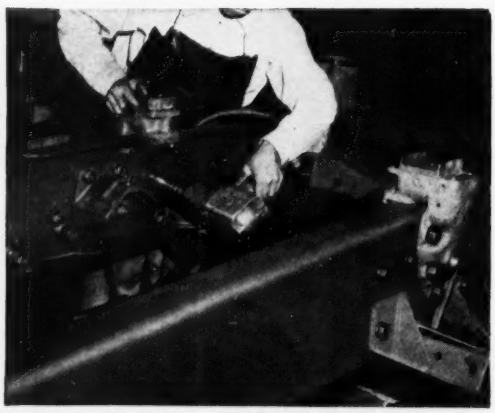
It's been a long time since the Autocar people switched from riveted to bolt-and-nut construction. Here's how it happened:

Two Autocar engineers took off on a coast-to-coast run to shake the bugs out of a new test model. Things went well until a riveted spring bracket broke. It took an entire day just to chisel through the rivets because it was hard to get at the bracket.

From that day on, it was *accessible* bolt-and-nut construction exclusively for all Autocar trucks. And Autocar standardized on RB&W bolts. One dividend from using these rugged bolts is that Autocar can specify higher-strength material than is practical for riveting. Furthermore, tests on structures like bridges show that rivets frequently loosen. This doesn't happen to bolts on Autocar frames.

Where you want to join structural members firmly together so they'll *stay* together for good, high-strength bolting is often your best bet.

As the leading manufacturer of all kinds of fasteners, we're in the unusual position of always being able to recommend and supply the right ones for all your needs. Write to RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N. Y.



FASTER FASTENING is achieved in the Autocar plant at Ardmore, Pa., by using air tools like the one shown here to run up RB&W nuts on RB&W bolts on an Autocar truck frame. In addition to making tight, accessible joints, bolting effects substantial assembly savings. 3.1

RB & W

108 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N. Y., CORAOPOLIS, PA., ROCK FALLS, ILL., LOS ANGELES, CALIF. *Additional sales offices at:* PHILADELPHIA, PITTSBURGH, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO. *Sales agents at:* PORTLAND, SEATTLE. *Distributors from coast to coast.*

(For more information on products advertised, use Inquiry Card page 245)

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Card below for further information

On New Catalogues described in this issue of MACHINERY

On products mentioned in the editorial pages

On products shown in the advertisements

NEW CATALOGUES

WELDING ALUMINUM—Reynolds Metals Co., Desk PR, 2500 S. Third St., Louisville 1, Ky. Handbook consisting of 186 pages of technical information on welding, brazing, and soldering aluminum. It contains material on thirty-four processes, a chart indicating those most widely used. Thirty-five tables are included. This book is available to engineers, designers, and company executives who request it on a company letterhead direct to the above address.

CUTTING TOOLS—Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill. Catalogue 51, containing 152 pages of specifications, detailed descriptions, and engineering information pertaining to Chicago-Latrobe Double-Circle Tools, such as twist drills, reamers, countersinks, counterbores, carbide tools, and tool bits. Can be obtained when requested on a business letterhead direct to the above address.

SCREWDRIVING TOOLS—Apex Machine & Tool Co., 1031 South Patterson Blvd., Dayton 2, Ohio. Catalogue 21, containing 60 pages of specifications, prices, and illustrations on the Apex line of production screwdriving tools. Can be obtained when requested on a company letterhead direct to the above address.

SCALE MODELS OF SOUTH BEND MACHINE TOOLS—South Bend Lathe Works, South Bend, Ind. Bulletin 5301, dscribing a three-dimensional scale model lay-out kit, which consists of reproductions of the entire South Bend line of machine tools, to aid in arranging floor plans for shops. The kit itself is available to shop officials on loan, as explained in the order form in the bulletin. 1

VALVES AND CYLINDERS—Logansport Machine Co., Logansport, Ind. The following revised catalogues are available: 100-4, air control valves; 200-4, hydraulic control valves; 100-1, stationary and rotating air cylinders; 200-3, 750 series and rotating hydraulic cylinders; 200-2, Rotocast hydraulic cylinders; and 100-2, heavy-duty mill type air cylinders. .. 2

SAW AND KNIFE SHARPENING MACHINES—Hanchett Mfg. Co., Big Rapids, Mich. Catalogue 55, containing useful information for the saw and knife fitter. There are six sections—band saws, circular saw sharpeners and grinders, saw swages, miscellaneous equipment, metal saw sharpening equipment, and knife grinding machines. 3

SCREW MACHINE PRODUCTS—Z & W Machine Products, Inc., Cleveland, Ohio. Booklet describing the company's facilities for manufacturing precision screw machine products, parts, and assemblies. Examples of typical products, such as tool-holders, hydraulic valves, and hand sprayers, are illustrated. 4

SPROCKETS AND ROLLER CHAIN—Dodge Mfg. Co., Mishawaka, Ind. Bulletin A-624, giving data on new Taper-Lock sprockets and Dodge roller chain. Selection data for roller chain drives include tables of service factors, horsepower ratings and calculations of chain length and center distance. 5

FURNACE AND INDUCTION BRAZING—General Electric Co., Schenectady, N. Y. Bulletin GEA-5889, describing how furnace and induction brazing can reduce costs and increase production. Typical G-E induction brazing installations are illustrated. 6

MULTIPLE-SPINDLE DRILL HEADS—Durant Tool Supply Co., Providence, R. I. Circular on Durant adjustable multiple-spindle drill heads for a wide variety of drilling jobs, as well as tapping, reaming, boring, and milling operations. 7

CENTER TIPS—Wall Colmonoy Corporation, Detroit, Mich. Bulletin CT-10, descriptive of Colmonoy lathe and grinding machine center tips which can be silver soldered on worn or new steel centers having Morse, B & S, or Jarno tapers, and tips for centerless grinder blades. 8

BLAST DEBURRING MACHINES—Modern Industrial Engineering Co., Detroit, Mich. Bulletin 103-57, descriptive of two standard Maizo blast machines for the production deburring of a variety of "soft" metal parts—one model for continuous operation, the other for stationary blasting of larger parts. 9

DESIGNING AND MANUFACTURING FACILITIES—Ace-Central States Machine Tool Co., Detroit, Mich. Booklet entitled "Design and Build," illustrating and describing the service and facilities of two Detroit tool companies which have combined to design and build special machinery and tooling. 10

TOOL SHARPENING—Micrometrical Mfg. Co., Ann Arbor, Mich. Bulletin L22 entitled "A Final Step in Tool Sharpening," explaning how time, tools, and material can be saved when cutting tools produce a consistent finish, and how the Profilometer can be used as part of tool sharpening procedures. 11

GEAR SHAVING MACHINE—National Broach & Machine Co., Detroit, Mich. Booklet S-53-7, describing the redesigned model GCU Red Ring gear shaving machine on which both conventional and diagonal shaving operations, as well as crowning and taper shaving, can be performed. 12

NICKEL ALLOYS IN RAILROAD EQUIPMENT—International Nickel Co., Inc., New York City. Booklet containing data on the use of nickel alloys in railroad applications, such as Diesel-electric locomotives, electric locomotives, steam locomotives, and passenger cars. 13

JIG AND FIXTURE COMPONENTS—Standard Parts Co., Bedford, Mass. 66-page manual presenting descriptions and drawings of numerous jig and fixture components available to save users design time and tooling costs. 14

WELDING NICKEL ALLOY STEELS—International Nickel Co., Inc., New York City. 43-page booklet entitled "The Welding of Nickel Alloy Steels," in which various welding processes for nickel alloy steels are described. Included are eighteen tables of comprehensive data. 15

LOW-ALLOY STEEL—Jones & Laughlin Steel Corporation, Pittsburgh, Pa. Booklet describing Jalten, a high-tensile, low-alloy steel (formerly known as Otiscoloy)—its physical properties and how it is being used for various applications. 16

MAGNESIUM PLATE AND SHEET—Brooks & Perkins, Inc., Detroit, Mich. Folder describing how magnesium plate and sheet can be used to reduce weight. A comparison of the gages required for equal stiffness in sheet magnesium, aluminum, brass, and steel is tabulated. 17

GAGING EQUIPMENT—Cleveland Instrument Co., Cleveland, Ohio. Bulletins descriptive of the Indi-Ac electronic indicator, Par-Ac electronic production gage, and Micro-Ac electronic micro-comparator—defining the fields of application of each instrument and showing it in use. 18

METAL FABRICATING FACILITIES—Danco Metal Products, Inc., Westlake, Ohio. Bulletin showing the Danco plant facilities and equipment available for industrial weldments, as well as sheet-steel and aluminum cabinets and enclosures the company manufactures. 19

STEEL TUBING—Rochester Products, Division of General Motors Corporation, Rochester, N. Y. Booklet furnishing technical information on the use, fabrication, and physical properties of small-diameter (1/8 to 5/8 inch) steel tubing. 20

FIRST CLASS
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New York, N. Y.

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148 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

PORTABLE ELECTRIC TOOLS—Thor Power Tool Co., Aurora, Ill. Catalogue 39-A, consisting of 40 pages of information on Thor universal electric industrial and automotive tools—drills, grinders, hammers, saws, screwdrivers, and many other tools. 21

ELECTRODE SELECTOR CHART—General Electric Co., Schenectady, N. Y. Electrode selector chart GEC-657E, containing condensed data on the company's line of mild-steel, low hydrogen-low alloy, low alloy-high tensile, hard-surfacing, and stainless-steel electrodes. 22

CAST ALLOY—Vascoloy-Ramet Corporation, Waukegan, Ill. Catalogue VR-451, describing Tantung 144, a new grade of Tantung, and giving technical data on applications, with a speed and feed chart showing the cutting range. 23

FASTENERS FOR RESISTANCE WELDING—Ohio Nut & Bolt Co., Berea, Ohio. Catalogue 53, listing stock parts in the company's line of fasteners used in resistance welding. A section on welding data is also presented. .. 24

ROTATING SHAFT SEALS—Cartriseal Corporation, Lincolnwood, Ill. Folder descriptive of a new double-face cartridge seal designed to meet the requirements of higher pressures, temperatures, and revolutions per minute... 25

CRUSH TRUING—The Norton Co., Worcester, Mass. Technical bulletin 531, on the subject of crush truing—definition, applications, equipment required, equipment suppliers, shapes and types of wheels, and other pertinent information. 26

DIE-PROFILER—Engis Equipment Co., Chicago, Ill. Folder illustrating and describing techniques for using the Di-Profiler, a precision reciprocating hand machine, in filing, lapping, scraping, honing, and polishing operations. 27

WELDERS WITH SPECIAL TOOLING—Progressive Welder Sales Co., Detroit, Mich. Catalogue 5301, showing Progressive standard welders equipped with a wide variety of tooling, such as hopper feds, indexing tables, and automatic clamping devices. 28

DRILLING UNIT—Drillunit, Inc., Detroit, Mich. Folder illustrating installations of the Drillunit, a small self-contained unit which can be mounted on a machine in any position for extra drilling and reaming jobs. 29

TAP SELECTOR—Threadwell Tap & Die Co., Greenfield, Mass. Pocket-size slide chart containing basic tap information for selecting and specifying the correct drill and lubricant, as well as the proper tap, for each job. 30

BUTT WELDERS—Solar Aircraft Co., San Diego, Calif. Folder giving concise information on Solar semi-automatic butt-welding machines for fabricating sheet metal into smooth cylinders and joining flat strips and sheets. 31

ELLIPTIC GEARS—Bilgram Gear & Machine Works, Philadelphia, Pa. Booklet explaining how Bilgram elliptic gears are manufactured and supplying a list of elliptic and oval gears for which calculations have already been made. 32

GENERAL-PURPOSE PUMPS—Tuthill Pump Co., Chicago, Ill. Catalogue 102, presenting the company's Model C series of general-purpose pumps for use with non-corrosive liquids with lubricating qualities. 33

INDUCTION MOTOR FOR PUNCH PRESS SERVICE—General Electric Co., Schenectady, N. Y. Bulletin GEA-5968, describing the G-E totally enclosed, fan-cooled, high-slip induction motor for punch press service. 34

FERROUS PIPE AND TUBING—Babcock & Wilcox Co., Beaver Falls, Pa. Data card TDC-154, tabulating the maximum allowable stress values for seamless and welded carbon- alloy- and stainless-steel tubing and pipe. 35

RUBBERIZED ABRASIVES—Cratex Mfg. Co., San Francisco, Calif. Catalogue 53, on Cratex rubberized abrasives for burring, smoothing, and polishing operations for general shop and tool-room requirements. 36

PASTE ALLOY SOLDERS—Fusion Engineering, Cleveland, Ohio. Bulletin describing the company's line of flux-containing electrical electronic, and mechanical bond paste solder and brazing alloys. 37

ZINC PHOSPHATE COATINGS—Oakite Products, Inc., New York City. Booklet entitled "How to Apply Better Zinc Coatings to Steel in Preparation for Painting," giving descriptive information on Oakite CrysCoat HC. 38

HONING MACHINES—C. A. Fulmer Co., Cincinnati, Ohio. Catalogue explaining the honing process and showing typical applications of Fulmer honing machines for the precision finishing of internal cylinders. 39

WORM GEAR DRIVES—Cleveland Worm & Gear Co., Cleveland, Ohio. Folder showing how Cleveland worm gear drives and speed reducers have been used in a wide variety of applications. 40

WIRE FORMED PARTS AND STAMPINGS—Pix Mfg. Co., Inc., Newark, N. J. Catalogue illustrating numerous wire formed parts and intricate stampings from many metals and alloys manufactured by the company. 41

TRIMMING DIES—Steel Products Engineering Co., Springfield, Ohio. Booklet on Brehm trimming dies for flat edge trimming and notching of drawn shells. Typical applications are shown. 42

ELECTRONIC CONTROLLERS—Bristol Co., Waterbury, Conn. Bulletin B226, describing the latest additions to the Series 500 line of free-vane electronic controllers. 43

SPEED REDUCERS—Westinghouse Electric Corporation, Pittsburgh, Pa. Booklet B-5646, describing features of Westinghouse speed reducers and manufacturing techniques. 44

BEARING BRONZE—Johnson Bronze Co., New Castle, Pa. Catalogue 530, comprising 104 pages, in which a complete list of stock sizes of Johnson general-purpose bronze bearings is presented. 45

METAL CASTINGS—Cadmet Corporation, Detroit, Mich. Folder illustrating ferrous and nonferrous metal castings made by the lost wax process, and wear strips made from No. 21 Ampco bronze. 46

AIR RELEASE AND AIR INLET VALVES—Simplex Valve & Meter Co., Philadelphia, Pa. Bulletin 1203, describing the functions of the Type AV combination air release and air inlet valve. 47

STRAIN GAGES—Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin consisting of a domestic price list for SR-4 strain gages, instruments, and accessories. 48

PUNCHES AND DIES—F. J. Stokes Machine Co., Philadelphia, Pa. Bulletin 611 entitled "How to Save Money on Punches and Dies," giving tips on punch and die maintenance. 49

POTENTIOMETERS — Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. Bulletin 1210, describing the features and operation of the Brown portable potentiometer. 50

SOCKET SCREW PRODUCTS—Brighton Screw & Mfg. Co., Cincinnati, Ohio, Catalogue 25, describing the Brighton line of socket screw products, including stainless-steel socket head cap-screws and hex socket set-screws. 51

ELECTRONIC TIMERS—Sciaky Bros., Inc., Chicago, Ill. Bulletin 315-10, on Sciaky electronic timers for short-interval control of mechanical and electrical operations. 52

HARD-FACING METALS—Mir-O-Col Alloy Co., Los Angeles, Calif. 52-page booklet, giving comprehensive information on hard-facing, as well as a description of the Mir-O-Col line of hard-facing metals. 53

FURNACES—Eclipse Fuel Engineering Co., Rockford, Ill. Bulletin D, covering the company's line of industrial furnaces for varied heating applications. 54

POWER SQUARING SHEARS—Peck, Stow & Wilcox Co., Southington, Conn. Folder descriptive of two power shears designed for the accurate reproduction of squared blanks. 55

SCREW MACHINE STOCK TUBES—Corlett-Turner Co., Chicago, Ill. Folder on CT silent stock tubes for screw machines, showing installations in screw machine shops. 56

COOLANT COOLER—Frostrode Division of Viking Products, Detroit, Mich. Bulletin 502, showing applications of Frostrode coolant coolers to some machine tools 57

PUSH-BUTTON ASSEMBLY FOR PANEL MOUNTING—Micro, Freeport, Ill. Data sheet 77, on the 1PB4 push-button assembly for panel mounting 58

SOCKET SCREWS—Parker Kalon Corporation, New York City. Folder 481C, illustrating how P-K socket screws are manufactured 59

Product Information Service

Use postage-free Business Reply Card below for further information concerning New Catalogues described in this issue and products mentioned in the editorial pages or advertisements.

Circle numbers of the catalogue items in which you are interested.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	

For more details on products mentioned in the editorial pages or shown in the advertisements in this issue, fill in below:

PAGE .....PRODUCT .....

PAGE .....PRODUCT .....

Please print your name and address

YOUR NAME .....TITLE .....

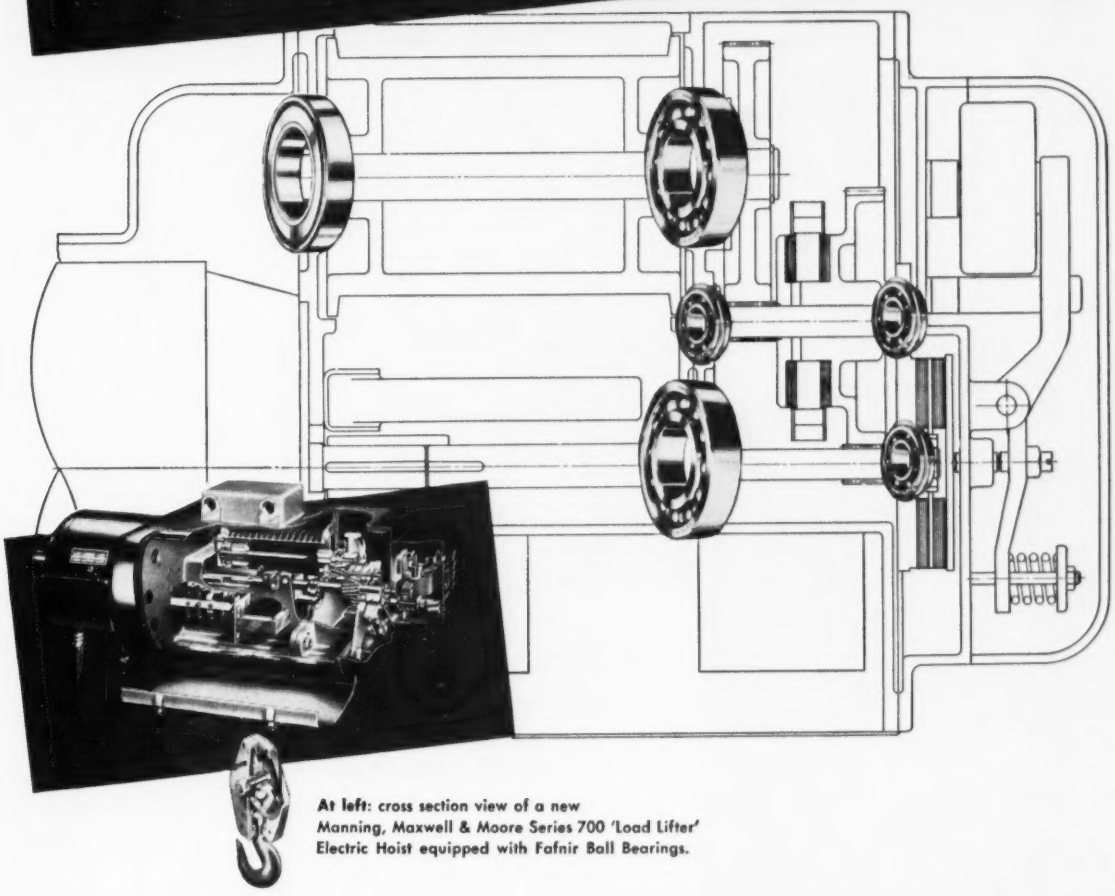
COMPANY .....

CO. ADDRESS .....

CITY .....ZONE.....STATE.....

This card is void after January 1, 1954 M-10/53

How an "Industrial Muscle" is kept from getting "Muscle-bound"



At left: cross section view of a new Manning, Maxwell & Moore Series 700 'Load Lifter' Electric Hoist equipped with Fafnir Ball Bearings.

Every bearing indicated in the diagram above highlights the strategy of Manning, Maxwell & Moore's electric hoist designers. Each eliminates a possible source of trouble caused by friction... on rope drum (bearing lubricated for life) on trolley assembly, on gear shafts, etc.

With critical turning points protected, this heavy-duty 1-ton capacity hoist is offered for three-shift lifting *every day in the year*. It lifts a ton, thirty feet a minute. Power is concentrated on lifting, not shared to overcome friction. It's smooth, steady, and efficient. Lubrication becomes a minor detail.

Fafnir is a supplier of Ball Bearings for Manning, Maxwell & Moore hoists and for hundreds of other industrial machines where Ball Bearing advantages improve performance and prolong service-life. The choice of Fafnir Ball Bearings, in case after case, has been influenced by the Fafnir "attitude and aptitude" . . . a way of looking at bearing problems from the designer's viewpoint, an aptitude for supplying the right ball bearing to fit the need. Maybe these attributes can help you solve a bearing problem. The Fafnir Bearing Company, New Britain, Connecticut.

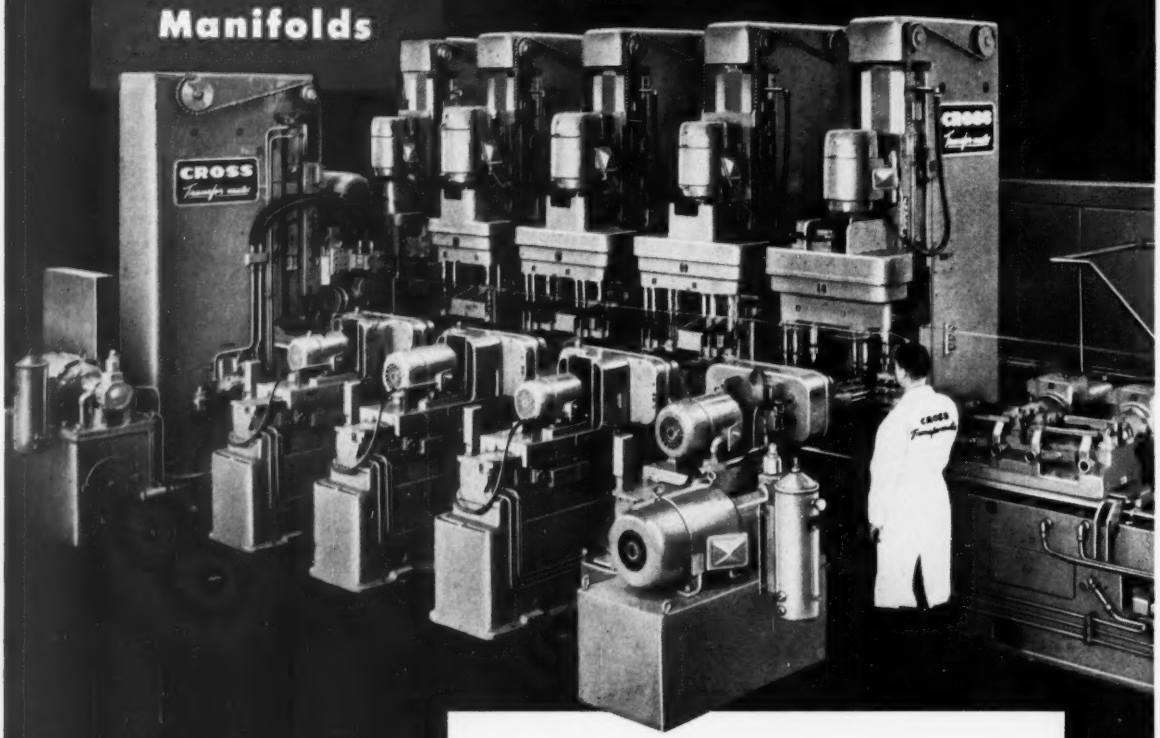
FAFNIR **BALL BEARINGS**

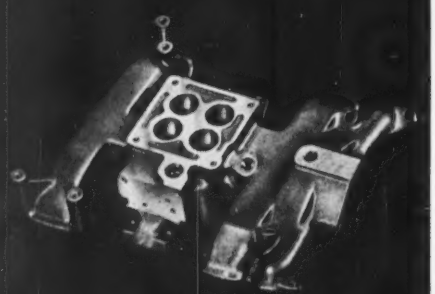
MOST COMPLETE LINE IN AMERICA

(For more information on products advertised, use Inquiry Card page 245)

Drills, Bores, Mills, Intake Manifolds

Another Transfer-matic by Cross





- ★ 218 parts per hour at 100% efficiency.
- ★ Seven stations including loading and unloading.
- ★ 54 operations—22 drilling, 8 chamfering, 2 reaming, 12 tapping, 8 boring and 2 milling.
- ★ Two parts machined at one time in each station.
- ★ Palletized work holding fixtures and automatic transfer from station to station.
- ★ Power wrenches for automatically operating work holding fixtures.
- ★ Other features: Pre-set tools, built-in chip conveyor, automatic cleaning unit for removing chips from fixtures, J.I.C. Standard Construction.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

(For more information on products advertised, use Inquiry Card page 245)



Between Grinds

By E. S. Salichs

The Last Word—in Print, Too

Not so long ago, the Editor met the top executive of a small eastern metal spinning concern, and during the conversation mentioned the metal spinning of square, octagonal, and odd-shaped parts. "Can't possibly be done," contradicted the executive who only spins circular parts. After a can-and-can't session, the Editor gracefully retired from the controversy on the can't note. But the final answer—can—appears on page 194 of this number. "Spinning Non-Circular Aircraft Components" is the Boeing story of how it is being done.

What's in Store for Thermistor?

No larger than an aspirin tablet, the Carboloy Thermistor is an instrument so sensitive to temperature changes that a puff of breath can cause it to step up control in an electrical current, and it is capable of detecting high-altitude guided missile temperature changes as minute as 0.0005 of one degree. The manufacturer, Carboloy Department of General Electric Co., points out that one use for the device is to suppress electrical surges in TV sets, prolonging tube life. A little Thermistor suppressing of theatrical surges might be helpful too. Thermistors can also be used in electric burners of kitchen ranges to prevent food from burning—while the cook is watching TV.

No Loose Lips or Pay Slips

Guiseppi Abbati, a new arrival in this country, found himself a job as a lathe hand at the Lovequist Engineering Co., Hollywood, Calif. He was busy at his lathe when the foreman walked up to him and said, "There's one thing, Guiseppi, I want you to remember. This work is of a very secret nature. Don't tell anyone what you are making." Guiseppi looked up and replied, "Don't-a you worry, boss. I'm even hold out five-a bucks a week on-a my old lady!" (contributed by Warren Stokes, Industrial Relations, Lovequist)

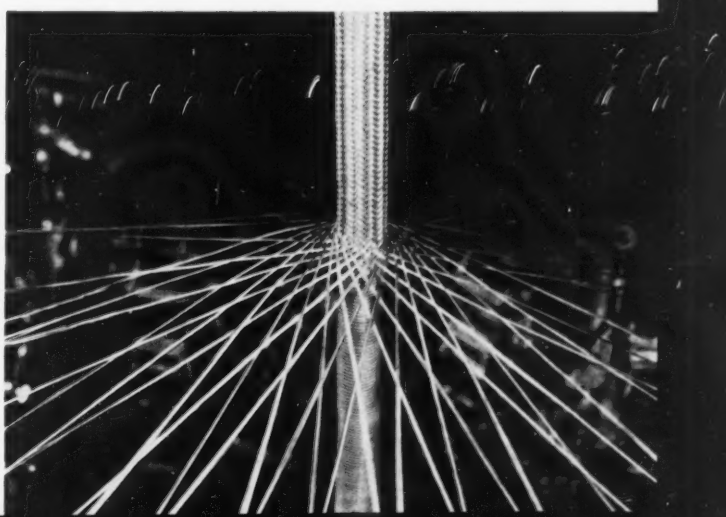
Dial or Dig

The risk element in hunting for oil is graphically shown by the Independent Petroleum Association of America by spinning a pointer on a card reminiscent of the ones that come with children's games. Eight sections on the cardboard wheel register Dry, and one Oil—but unlike the chances involved in parlor games, the Association estimates that each "spin" would cost the speculator $90,000.

Fan and Friend

"MACHINERY covers the metalworking field like Mickey Mantle covers the outfield" was the way a Yankee rooter and aircraft executive writing to the Editor chose to compliment our magazine in his letter.

The Month: November ***The Theme: Automotive Production*** ***The Magazine:*** MACHINERY



INDUSTRIAL MAYPOLE—This machine is applying braid directly to the inner core of flexible metal hose at Titeflex, Inc., Newark, N. J. This job is a 1-over-1 weave but the braiding can be done in 2-over-2 weaves and other combinations. The machine has from 16 to 48 braid carriers—unlike maypole dancers on the village green who hilariously get the streamers all tangled up as they weave in and out, these carriers end up neatly at the bottom of the hose.

News

California and Washington

JOHN H. PUGH has been named director of advertising and public relations for the Axelson Mfg. Co., Division of Pressed Steel Car Co., Inc., Los Angeles, Calif. The Division produces oil-well pumping equipment, engine lathes, and aircraft landing-gear components.

E. H. PARDUHN was recently appointed district engineering representative in charge of the Pacific Northwest by the Oilgear Co., Milwaukee, Wis. He was formerly a representative in the Los Angeles, Calif., area, and now replaces R. E. DAVIS, who is undertaking special engineering assignments in Milwaukee. Mr. Parduhn's headquarters will be at 914 Arctic Bldg., Seattle, Wash.

Illinois

ROBERT E. SANFORD has joined the staff of engineering consultants in the Clearing Machine Corporation, Chicago, Ill., power press manufacturer. Mr. Sanford comes to Clearing from the National Machinery Co., Tiffin, Ohio. He has worked in every phase of the design and construction of forging presses, as well as cold-heading and bolt-making machinery.

JOHN E. BUSH has become district representative in the Chicago, Ill., territory for the Elmes Engineering Division of American Steel Foundries, Cincinnati, Ohio. Mr. Bush was formerly located at the company's main office in Cincinnati. His headquarters in Chicago are at 410 N. Michigan Ave.

MARTIN J. WIORA has been appointed president of the Bryant Machinery & Engineering Co., Chicago, Ill., succeeding the late president, A. G. Bryant. Also announced were the appointments of CHARLES B. TANSLEY as executive vice-president and ROBERT A. COLE as vice-president.

CLARE PERLIN & ASSOCIATES, 107 Columbia Ave., Park Ridge, Ill., have been appointed Midwest representatives covering Wisconsin, Illinois, and Indiana by the SIMMONS MACHINE TOOL CORPORATION, Albany, N. Y.

CARL F. JENSEN has been appointed plant manager of the Des Plaines, Ill., stamping plant of the Shakeproof Division of Illinois Tool Works, Chicago, Ill. Along with these duties, Mr. Jensen will continue to be responsible for the Division's special products engineering and sample parts operations located in Elgin, Ill.



Carl F. Jensen, Des Plaines stamping plant manager for the Shakeproof Division of Illinois Tool Works

NOX-RUST CHEMICAL CORPORATION announces its removal to a new plant at 47th St. and Central Ave., Chicago, Ill.

Michigan and Wisconsin

SHEAR-SPEED CHEMICAL PRODUCTS DIVISION, MICHIGAN TOOL CO., Detroit, Mich., announces the appointment of five representatives in the following areas: Central New York State—R. W. GLAHN, 213 Meadow Road, Syracuse 4, N. Y.; Kansas and Oklahoma—L. D. SUPPLY CO., 117 W. Latimer St., Tulsa, Okla., and 436 Maple St., Wichita, Kan.; western Maryland and adjacent Ohio counties, western Pennsylvania and northern West Virginia—E. J. MADDOCK, 207 Investment Bldg., 239 Fourth Ave., Pittsburgh 22, Pa.; northern Indiana and adjacent Michigan counties—T. S. MELLEN, 601 Tower Bldg., South Bend 1, Ind.; and northeastern Ohio—PIERCE & RODMAN, 640 Penton Bldg., Cleveland 13, Ohio.

JOHN H. SMEDLEY has joined the Carboloy Department of General Electric Co., Detroit, Mich., as a design and application engineer in the permanent magnet products design and application section, and GORDON H. GILLIS as a heat-treating engineer in the carbide process and development section. Also announced was the appointment of EUGENE J. LENAR as engineer in the metallurgical process and quality control unit for permanent magnet materials at the Edmore, Mich., plant. CHARLES E. ST. THOMAS was made manager of advertising and sales promotion. Mr. St. Thomas fills the post formerly held by the late E. C. Howell; he was news bureau manager at the time of his promotion, this position now being filled by JAY DE EULIS.

RAY KENSEL has been named district sales manager for the Cleco Air Tool Division of the Reed Roller Bit Co., Houston, Tex., his area covering Detroit, Cleveland, Cincinnati, and Indianapolis, with headquarters in Detroit, Mich. He replaces B. O. STOOTHOFF, who has resigned. Before his promotion, Mr. Kensel was a sales representative for Cleco at Fort Worth, Tex.

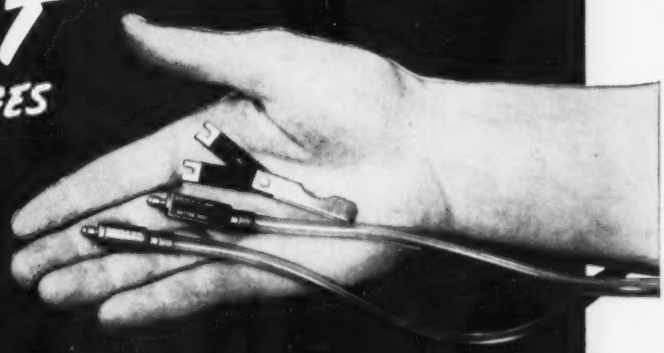
UNITED STOVE CO., Ypsilanti, Mich., subsidiary of Gar Wood Industries, Inc., Wayne, Mich., recently changed its name to UNITED METAL CRAFT CO. The subsidiary produces stampings, components, and assemblies for the automotive and appliance industries, as well as automotive hydraulic truck equipment.

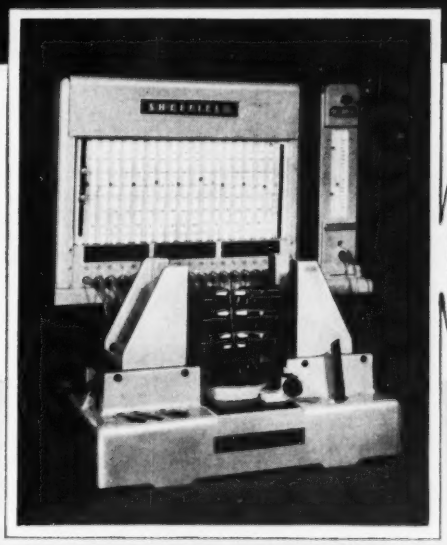
GEORGE C. STEYSKAL was recently appointed factory manager and head of the new service department of the Standard Tool & Mfg. Co., Detroit, Mich. DAVID A. TYO, JR., was made plant superintendent. Also announced by the company was the addition of 2000 square feet of floor space to the assembly department.

R. CARTER DYE and JULES F. SAUT have been appointed manager, automotive market, and assistant manager, automotive market, respectively, by the Reynolds Metals Co., Louisville, Ky. They will be located in the Detroit, Mich., office, devoting themselves to applications of aluminum in the automotive industry.

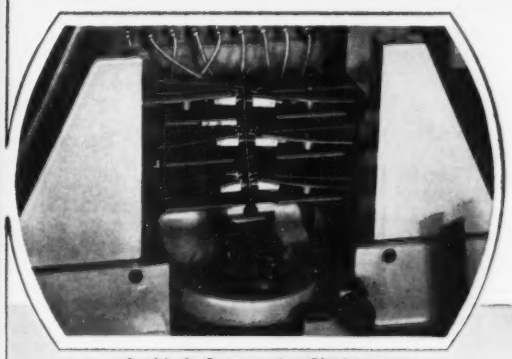
FOUNDRY DIVISION OF THE EATON MFG. CO., Vassar, Mich., announces the following promotions: S. DAVID TYLER, assistant general manager; PAUL W. OLSON, resident manager; HOWARD R. JOHNSON, factory manager; and RALPH F. EVERT, assistant sales manager.

PLUNJET
GAGING CARTRIDGES





Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.

PLUNJET GAGING CARTRIDGES . . . the self-contained gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

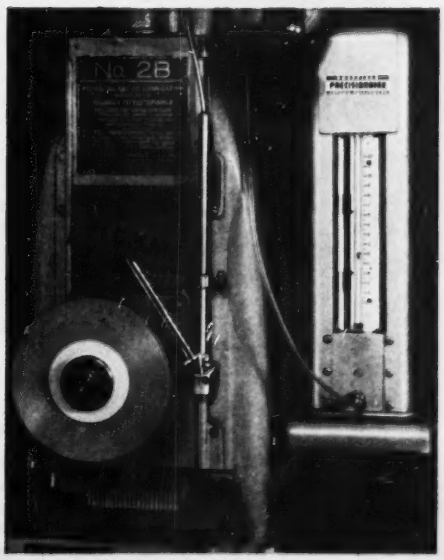
THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

***WRITE FOR ENGINEERING DATA** giving ranges, amplifications, applications, mounting dimensions and prices.*

IMMEDIATE DELIVERY FROM STOCK



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

6302

SHEFFIELD HEADQUARTERS

the **Sheffield** corporation

DAYTON 1, OHIO, U.S.A.



E. H. H. Graf, vice-president in charge of sales for the Detroit Broach Co.

E. H. H. GRAF was recently appointed vice-president in charge of sales by the Detroit Broach Co., Rochester, Mich. Mr. Graf, who joined the company as sales manager early this year, has been associated with the broaching industry for many years.

ROBERT M. BARNUM was recently appointed sales engineer for the Butterfield Division, Union Twist Drill Co., Derby Line, Vt., cutting tool manufacturer. He will represent the Division in southern Michigan, with headquarters in Detroit.

WAGNER BROTHERS EQUIPMENT CO., a new firm organized by Wagner Brothers, Inc., has acquired a plant at 42056 Michigan Ave., Wayne, Mich., for the manufacture of an automatic electroplating machine and other plating equipment.

KURT ORBAN CO., INC., New York City, has moved its Detroit, Mich., office and service center to larger quarters at 18627 James Couzens Highway.

WILLIAM E. JOHNSON has been named district representative in the Cleveland, Ohio, area for the Gisholt Machine Co., Madison, Wis. Mr. Johnson has been with the company since 1948; in his new position, he will be assistant to WILLIAM E. CLARK, whose office is located at 14812 Detroit Ave., in Cleveland. RODNEY H. STEBBINS has been appointed district representative for the Milwaukee area. Mr. Stebbins has been associated with Gisholt for nearly fifteen years. His address will be 225 E. Michigan Ave., Milwaukee 2, Wis.

MILWAUKEE GEAR CO., Milwaukee, Wis., gear and shaft manufacturer, is completing construction of a new plant containing 110,000 square feet of floor space.

Missouri and Texas

NORDBERG MFG. CO., Milwaukee, Wis., announces the establishment of a south central district office at 3300 S. Second St., St. Louis, Mo. HAROLD M. PROPP, formerly central district manager at Milwaukee, has become head of the new office.

LEE HORNEYER CO., 7 N. Grand Blvd., St. Louis, Mo., was recently made representative in eastern Missouri and southern Illinois for the GENESEE MFG. CO., Rochester, N. Y., manufacturer of production tools.

RUSSELL J. SMITH was recently appointed sales representative in Illinois, Kentucky, and Missouri by Snap-Tite, Inc., Union City, Pa. Mr. Smith's headquarters are at 1601 Grand Blvd., St. Louis, Mo.

LEHMANN BORING TOOL DIVISION, St. Louis, Mo., has moved to larger quarters in the same city—at 4389 Duncan Ave., St. Louis 10. The boring tool company is a division of the NOVO ENGINE CO., Cleveland, Ohio.

SCULLY-JONES & CO., Chicago, Ill., manufacturers of precision holding tools, have recently named the following distributors in Texas: TOOL SUPPLY & ENGINEERING CO., 1901-03 Canton St., Dallas; and DOLAN INDUSTRIAL SALES, 5506 Lawndale Ave., Houston.

VIRGIL C. REED has been named field representative in the Southeast and Southwest by the Alloy Rods Co., York, Pa. Mr. Reed will make his headquarters at 7216 La Paseo Drive, Houston 17, Tex.

New England

J. DOYLE DEWITT was recently elected to the board of directors of the Niles-Bement-Pond Co., West Hartford, Conn., and LOUIS REISS was appointed treasurer. Mr. DeWitt fills the vacancy created by the recent retirement of HUBERT D. TANNER, who was vice-president of the company. Mr. Reiss succeeds RICHARD W. BANFIELD who was treasurer as well as vice-president. Mr. Banfield will now devote his full time to managing the company's Small Tool and Gage Divisions.

F. W. BORCHERS has recently been promoted to the position of general sales manager of the Bristol Co., Waterbury, Conn. Mr. Borchers joined the company's sales engineering organization in 1922. In 1948, he was appointed assistant sales manager. The company has also announced at this time an expansion program which is increasing its capacity to manufacture Bristol multiple-spline and hex socket screws.

W. G. LE COUNT TOOL WORKS, Norwalk, Conn., manufacturers of expanding mandrels, have recently been incorporated as the LE COUNT TOOL WORKS, INC., and have moved to larger quarters at 390 Capitol Ave., Hartford, Conn. JOHN H. DOWD and MICHAEL LOMBARDI are taking over management of the plant, W. H. LE COUNT being retained in a research and advisory capacity.

GEORGE A. KREPPS has been named director of inspection for the New Departure Division, General Motors Corporation, Bristol, Conn., succeeding ROBERT E. YOUNG, who recently retired. Mr. Krepps was assistant director of inspection at the time of his promotion, and has been associated with General Motors for the last thirteen years.

ROBERT L. STOCKUS has joined the Farrel-Birmingham Co., Inc., Ansonia, Conn., in the capacity of assistant manager of the company's rolling mill division. Prior to this appointment, Mr. Stockus was sales manager at the Armzen Co., Waterbury, Conn.

BURTON G. EBBESON and CHARLES M. WELLONS were recently appointed field engineers by the Norton Co., Worcester, Mass. Mr. Ebbeson was appointed to the Worcester area with headquarters at the main Norton plant, while Mr. Wellons will work out of the Philadelphia, Pa., office.

DR. NEWMAN W. THIBEAULT has been named assistant director of research and development in charge of the physical research and microscopic sections by the Norton Co., Worcester, Mass. Dr. Thibeault succeeds the late A. Albert Klein, with whom he was closely associated since 1936.

SATTERLEE CO., 118 Washington Ave., N., Minneapolis, Minn., has been appointed a dealer for the Reid precision surface grinder manufactured by REID BROTHERS CO., INC., Beverly, Mass.

JEROLD L. WELCH has become chief engineer of the Reed-Prentice Corporation, Worcester, Mass.

New York and New Jersey

JAMES M. KENNEDY, president of Revere Copper & Brass Inc., New York City, was recently elected chairman of the board and chief executive officer, succeeding the late James J. Russell. CHARLES A. MACFIE

(*Continued on page* 257)

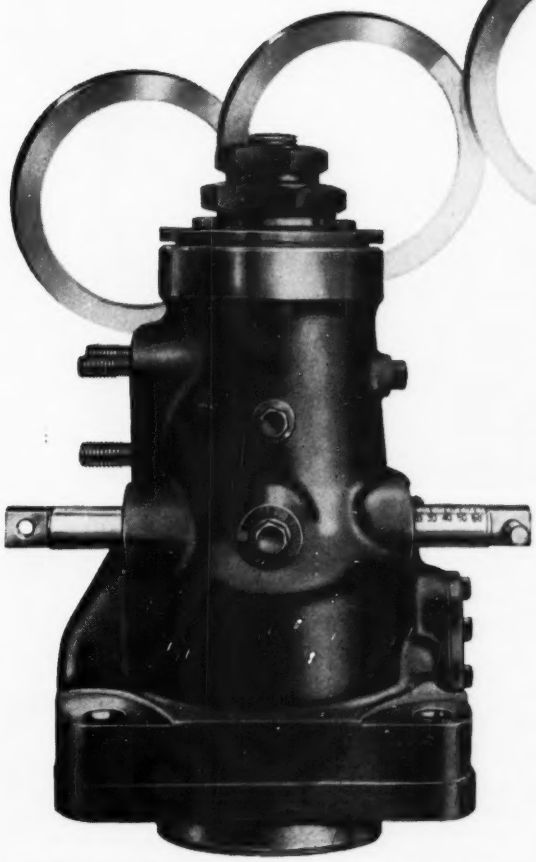


TO MAKE HEAVY-DUTY COPPER

Gaskets

USE REVERE DEOXIDIZED

Tube!



Diesel Fuel Injection Pump, made by American Bosch Corp., Springfield, Mass., and gaskets made by cutting rings off 2" deoxidized copper tube.

• An important extra service rendered by Revere consists of collaboration in setting up specifications. This is valuable because there are many different Revere Metals, each with special characteristics. No one copper, for example, will serve to best advantage in every application. A case in point is the matter of copper gaskets for Diesel fuel injection pumps. Copper is of course an ideal metal for gaskets, and is widely used for that purpose. But for this special application, which copper and in what form? The pump is used on large engines for municipal generating plants. It weighs 186 pounds, and must produce the high pressure required to inject fuel near the top of the Diesel compression stroke. Naturally, the load is a pulsating one. American Bosch Corporation came to Revere with the problem. Our suggestion was that much scrap could be saved if the gaskets were made by cutting rings off copper tube, instead of stamping them from strip. This achieved a double purpose, since the tube is made of deoxidized copper, which is superior in this application to electrolytic. We are able to report that these recommendations proved successful. . . . This work was done by the Revere Technical Advisory Service. To get in touch with it, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

(For more information on products advertised, use Inquiry Card page 245)

SIMPLIFY PURCHASING...

Buy Starrett



HACKSAWS

STARRETT

BAND SAWS

FAST-KUT

BAND KNIVES

1 THE COMPLETE LINE

Hacksaws, band saws and band knives in all types and sizes to meet all requirements . . . all from one dependable source.

2 MADE BEST TO CUT BEST

Precision made to insure correct set for clearance, exact size, uniform temper and maximum cutting ability.

3 EASIEST TO BUY

Stocked and sold by industrial distributors everywhere for prompt, dependable, on-the-spot service.



GUIDES TO LOWER CUTTING COSTS

Starrett Hacksaw and Band Saw Catalog and Quick Reference Metal Cutting Guide. Write for them. Address Dept. D

STARRETT TOOLS

TRADE MARK

Starrett

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SINCE 1880

WORLD'S GREATEST TOOLMAKERS



THE L. S. STARRETT COMPANY

Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Prompt delivery
Dependable service
Quality products

VISIT THE STARRETT EXHIBIT—BOOTH 2603—NATIONAL METAL CONGRESS—CLEVELAND, OCTOBER 19-23

(For more information on products advertised, use Inquiry Card page 245)

MACHINERY'S DATA SHEETS 739 and 740

SUGGESTED CORRECTIVE MEASURES FOR VARIOUS SAWING PROBLEMS — 1

Problem	Corrective Measures
Premature dulling of teeth	1. Use lower band velocity. 2. Use finer pitch saw band. 3. Apply proper coolant when cutting ferrous and non-ferrous materials. 4. Keep teeth engaged. Do not allow the teeth to idle through cut. Increase feeding pressure. 5. Apply coolant at point of cut, saturating the teeth evenly when cutting ferrous and non-ferrous alloys. 6. Be sure saw band is running with teeth pointing down.
Saw band vibrating in cut	1. Increase or decrease band tool velocity, depending on the material being cut and work thickness. 2. Increase band tension. 3. Use finer pitch saw band. 4. Increase feeding pressure. 5. Hold work firmly.
Surface of finished cut too rough	1. Increase band velocity. 2. Use finer pitch saw band. 3. Use slower feeding rate. 4. Apply coolant or lubricant.
Saw-band teeth ripping out	1. Use fine-pitch saw bands on thin work sections. 2. Eliminate vibration by holding work firmly while being fed into saw band. 3. Use coolant on ductile materials. 4. If gullets are loading use higher viscosity lubricant or coolant. 5. Reduce feeding pressures.
Premature saw-band breakage	1. Gage of band too heavy for diameter of wheels and speed of machine. 2. Decrease saw-band velocity. 3. Check periphery of wheels for defects. 4. Cracking at weld. Try long annealing period, decreasing heat gradually. 5. Pitch too coarse. Decrease unit load by using finer pitch. 6. Decrease feeding force. 7. Decrease band tensions. 8. Properly adjust band tool guides. 9. Apply lubricant or coolant.
Saw band curving in passing through work	1. Increase band tension. 2. Adjust saw guides close to work. 3. Use coarser pitch saw band. 4. Decrease feeding force.

MACHINERY'S Data Sheet No. 739, October, 1953

Compiled by the DoAll Co.
Des Plaines, Ill.

SUGGESTED CORRECTIVE MEASURES FOR VARIOUS SAWING PROBLEMS — 2

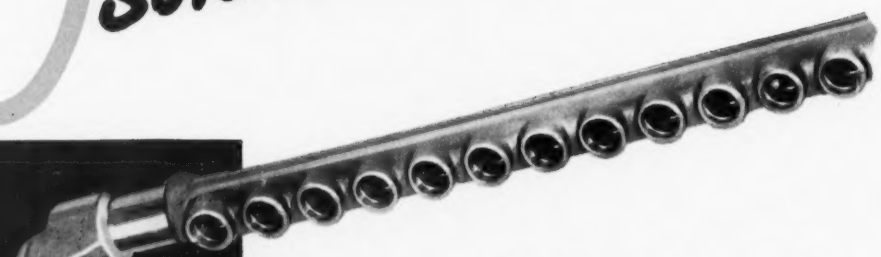
Problem	Corrective Measures
Gullets loading	1. Use coarser pitch saw band. 2. Apply coolant or lubricant. 3. Lower band velocity.
Saw band not running true against saw guide back-up	1. If clicking against saw guide back-up bearing, remove burr on back of saw band where joined. 2. If hunting back and forth against saw guide back-up bearing, reweld with back of saw band in true alignment. 3. Check alignment of band carrier wheels. 4. Check saw guide back-up bearing. If worn or unbalanced, replace same.
Negative camber developing in saw band	1. Saw band riding too heavy on saw guide back-up bearing. Adjust band for alignment on top and bottoms wheels.
Saw Band developing twist	1. Saw band binding in cut. Decrease feeding pressure. 2. Side inserts or rollers of saw guides adjusted too close to band tool. 3. Wrong width band for radii. 4. Decrease band tension.
Saw band leading in cut	1. Unbalanced set or partial dullness caused by striking hard inclusion in material being cut. Cutting oil will help reduce this trouble. 2. Saw guides out of adjustment. Carefully readjust guide inserts or rollers. If worn, replace same. 3. In the case of brush-equipped cut-off machines, make sure brushes are properly adjusted. If worn, replace with new. 4. Feeding pressure or rate of feed too high. Reduce feeding pressure.
Cutting rate too slow	1. Increase band velocity. 2. Use coarser pitch saw band. 3. Increase feeding pressure. 4. Apply coolant or lubricant.
Premature loss of set	1. Saw band too wide for radii being cut. 2. Reduce saw-band velocity. 3. Introduce coolant.
Positive camber developing in saw band	1. Feeding pressure too heavy. 2. Use coarse-pitch saw band to permit greater tooth penetration. 3. Saw guides too far apart. Adjust closer to work.

MACHINERY'S Data Sheet No. 740, October, 1953

Compiled by the DoAll Co.
Des Plaines, Ill.

80 SURFACES IN 1 CYCLE



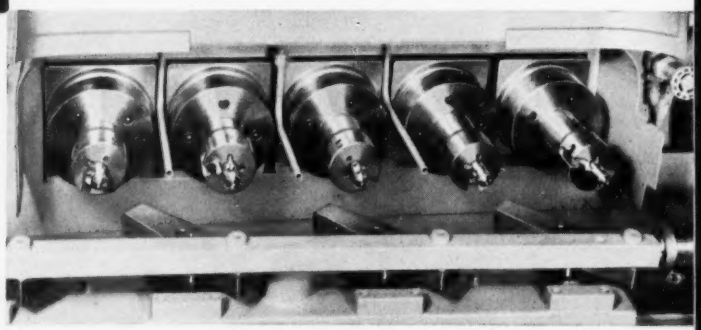


EX-CELL-O

MACHINE BORES, COUNTERBORES, FACES AND CHAMFERS 20 HOLES

This Ex-Cell-O Precision Boring Machine performs operations on 80 surfaces in one cycle on the projecting holes of a cotton picker bar assembly. Five spindles on the machine bridge are positioned to engage every fourth hole. The fixture indexes automatically between machining strokes to align the next set of holes with the boring bars.

The machine is a standard Style 112-C having a heavy well-ribbed base and table, long stroke; handles medium-sized and large work.



Ex-Cell-O's line of standard Precision Boring Machines is exceptionally complete. Ask your local Ex-Cell-O representative about them, or write to Ex-Cell-O in Detroit for Catalog 31205.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

XLO
EX-CELL-O *for* PRECISION

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

53-37

succeeds Mr. Kennedy as president. Mr. Macfie was elected a vice-president by Revere in 1934, and later became vice-president in charge of merchandise sales. In 1947, he was appointed vice-president and general sales manager of all rolling mill sales. RAYMOND P. WINBERG replaces Mr. Macfie as general sales manager. He was in charge of the Rome Division, Rome, N. Y., at the time of his promotion. Also announced was the election of ROBERT M. LAKE as a vice-president. Mr. Lake, who has been sales manager of the Rome Division since 1950, will assume the post vacated by Mr. Winberg.

SAMUEL N. COMLY, vice-president and treasurer of Russell, Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y., has been granted a leave of absence to serve as assistant administrator of the New York Production Authority, United States Department of Commerce, Washington, D. C. Mr. Comly will be responsible for operations of the industry divisions of NPA. In addition, he will assist in planning and staffing the proposed Business Services Administration, successor agency to NPA.

MANZEL DIVISION OF FRONTIER INDUSTRIES, INC., Buffalo, N. Y., has acquired the PULSOLATOR DIVISION OF RIVETT LATHE & GRINDER CO., INC., Brighton, Mass., thus expanding the Manzel line of lubricators. The Pulsolator product is a pump lubricator circulating oil to multiple outlets, and has been on the market for about twenty years. Manufacturing operations of the newly acquired division will be moved to the Babcock St., Buffalo, plant.

EDWARD K. HOW has been named manager of sales for the Welding Department of the General Electric Co., Schenectady, N. Y. Mr. How has been with the company for more than twenty years in various capacities. Since 1947, he was sales manager in the Locke Department.



Edward K. How, manager of sales for the G-E Welding Department

J. J. BASCH, Philadelphia, Pa., division manager for Oakite Products, Inc., New York City, was recently appointed manager of research and managment development. Mr. Basch, who has been with the company for twenty-eight years, will be in charge of the company's expanding technical research program. He was also made a member of the executive committee of the board of directors, of which he has been a member since 1948. W. A. BALTZELL, formerly southern division manager, was made assistant sales manager.

FRED A. MILNES has joined the Harrington - Wilson - Brown Co., Mount Vernon, N. Y., eastern machine tool distributor, in the capacity of press specialist. He will supervise the sales and service of mechanical and hydraulic presses manufactured by the Clearing Machine Corporation. Mr. Milnes was formerly associated with the E. W. Bliss Co. The company recently moved from the Chrysler Bldg., New York City, to 25 Beechwood Ave., Mount Vernon.

C. B. SPASE, chief engineer of the Clutch Division at the Lipe-Rollway Corporation, Syracuse, N. Y., has been appointed chief engineer of automotive development, and will be responsible for all automotive research. ROBERT S. ROOT, who was assistant chief engineer, succeeds Mr. Spase as chief engineer in the Clutch Division.

THEODORE BOOTH, general manager of the Bonded Products and Grain Division of The Carborundum Company, Niagara Falls, N. Y., has been elected vice-president. Mr. Booth came to Carborundum in 1952, at which time he was made director of manufacturing.

SIMMONS MACHINE TOOL CORPORATION, Albany, N. Y., has become the exclusive export sales agency for the ACE-CENTRAL STATES MACHINE TOOL CO., Detroit, Mich. The Simmons Export Division is located at 50 E. 42nd St., New York City.

TUBE DISTRIBUTORS CO., INC., which recently moved to Garden City, N. Y., announces the addition of alloy bars to its present stock.

MONROE TUBE CO., INC., Monroe, N. Y., announces a 10,000 square foot addition to its present plant.

P. L. CODDINGTON has been made assistant to the president of the Carpenter Steel Co., Reading, Pa. He will continue to be at the Alloy Tube Division, Union, N. J., where he has been manager of sales since 1945. WILLIAM R. STAPLES, formerly assistant manager of sales in the Alloy Tube Division, has been promoted to the post of manager of sales. Also announced was the appointment of NIELDS B. HAAS as Mideastern regional sales manager. Since 1947, Mr. Haas served as territorial representative of the Division in Ohio, Pennsylvania, New York, and Virginia.

FEDERATED METALS DIVISION, AMERICAN SMELTING & REFINING Co., New York City, recently acquired a research foundry at South Plainfield, N. J.

J. H. MATTHEWS has been appointed executive vice-president of Raybestos-Manhattan, Inc., Passaic, N. J.

Ohio

HARRY B. LILLEY has been promoted to the position of manager of the Steel and Tube Division district office in Detroit, Mich., by the Timken Roller Bearing Co., Canton, Ohio, replacing L. W. EPPLER, who recently resigned. Mr. Lilley was formerly manager of this Division's office in Houston, Tex. The vacancy created is being filled by JOHN J. MCGRANN, who was a sales engineer in the Houston office. Also announced was the transfer of R. R. HERSHEY, a sales engineer, from the Milwaukee, Wis., to the Detroit, Mich., office. Succeeding Mr. Hershey in Milwaukee is M. A. CONLEY, who was a sales engineer in the Cleveland office.

A. H. DAVIS, assistant works manager for the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, was recently promoted to the post of works manager. Mr. Davis has been with the company for eighteen years. D. W. LEBLOND fills the vacancy of assistant works manager. Also announced were the appointments of



A. H. Davis, works manager of the R. K. LeBlond Machine Tool Co.

L. M. BOUTTON as assistant shop superintendent and D. W. HELVEY as night superintendent.

DINGLE-CLARK CO., Cleveland, Ohio, sales representative of the Cleveland Worm & Gear Co. and the Farval Corporation, both of Cleveland, Ohio, recently transferred R. V. ROBISON from the Pittsburgh, Pa., office, where he was sales engineer, to Cleveland where he will be manager of the Machinery Division in the Cleveland territory. Mr. Robison will be replaced in the Pittsburgh office by L. B. ABRAMS, JR.

DEAN M. COCHRAN was recently appointed assistant sales manager for the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. In addition to his administrative sales activities, Mr. Cochran was also made manager of the Metal-Working and Process Press Sales Division of H-P-M.

A. H. TINNERMAN, president of Tinnerman Products, Inc., Cleveland, Ohio, since 1939, has become chairman of the board, while GEORGE J. SCHAD, vice-president, has been named president. Mr. Schad has been associated with the company for twenty years, and was elected a vice-president in 1952.

RICHARD J. RAND was recently named assistant manager of the Cincinnati, Ohio, sales office by the Crucible Steel Company of America, Pittsburgh, Pa. He was formerly assistant branch manager at Pittsburgh.

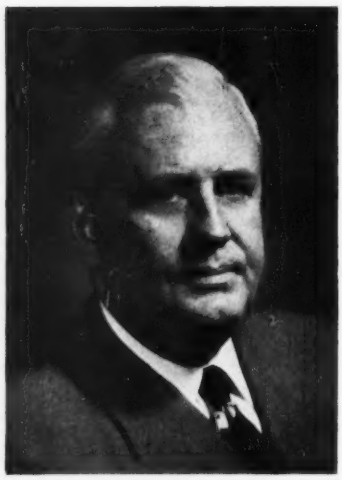
CHARLES C. REIFF, chief engineer at the Barberton, Ohio, plant of the Rockwell Mfg. Co., Pittsburgh, Pa., has been promoted to the post of chief engineer in the Delta Power Division at Bellefontaine, Ohio.

CHARLES E. SCHMITT has joined the Ace-Central States Machine Tool Co., Detroit, Mich., in the capacity of Ohio sales engineer. Mr. Schmitt will have his office in the Carnegie Hall Bldg., Cleveland, Ohio.

EARL J. BOYER has joined the Sheffield Corporation, Dayton, Ohio, as application engineer for the Measuray, a non-contact X-ray gage for measurement of strip or sheet stock.

ARCAIR CO., Bremerton, Wash., manufacturer of torches and electrodes, announces the establishment of an Eastern Division to be located at 423 S. Mt. Pleasant Ave., Lancaster, Ohio.

EUGENE B. FILES was recently named manager of sales for the Union Drawn Division, Massillon, Ohio, of the Republic Steel Corporation, Cleveland, Ohio, succeeding the late Fred C. Young. Mr. Files has been with Republic and predecessor companies for thirty-three years, and in the Detroit, Mich., office since 1930, in recent years being assistant district sales manager there.



Eugene B. Files, manager of sales for the Union Drawn Division of the Republic Steel Corporation

HARRY C. FLEMING, JR., has been named representative in the Youngstown, Ohio, area for the Warehouse Division of the Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

ROD CUTTING CO., Cleveland, Ohio, screw machine products manufacturer, has changed its name to the CAYCE CORPORATION.

Pennsylvania

KENNAMETAL, INC., Latrobe, Pa., has established a southern sales district with E. J. CONLAN as district manager. Headquarters of the new district are at 70 Fourth St., N. W., Atlanta, Ga. The district will include North and South Carolina, Georgia, Florida, Alabama, Tennessee, and northern Mississippi. Also announced were the following appointments in other districts: WALTER HENRY and FRANK MINION, representatives in the Cleveland, Ohio, office; and ANDREW HORVATH, in the Philadelphia, Pa., office. The following service engineers have been added to district office staffs: GERALD J. KELLEY, Detroit, Mich.; JAMES R. MORGAN, Cleveland, Ohio; and ALBERT L. MORSHAUSER, Cincinnati, Ohio.

CARPENTER STEEL CO., Reading, Pa., announces the following promotions: C. W. WINDFELDER, formerly manager of the company's Milwaukee, Wis., mill branch warehouse, has been appointed assistant to the vice-president, his headquarters continuing to be located in Milwaukee; F. P. McCAHAN, sales engineer at Milwaukee, has succeeded Mr. Windfelder as branch manager; W. J. STEPHENS, has been promoted from sales engineer to manager at St. Louis, Mo.; and R. L. RIEGEL, formerly in the tool and alloy sales department in Reading, has been advanced to assistant manager of alloy steel sales.

RAYMOND N. GRUBER has been named director of marketing research by the Standard Pressed Steel Co., Jenkintown, Pa., manufacturer of metal fasteners and shop equipment. Mr. Gruber was formerly sales manager for the company's Unbrako line of socket screw products, dowel pins, and pressure plugs. This position will now be filled by CHARLES J. BETZ, who was assistant sales manager. JOHN W. BREITMAYER succeeds Mr. Betz in this capacity.

WHITFIELD J. BELL, abrasive engineer in Maryland and Delaware for the Norton Co., Worcester, Mass., has retired after thirty-eight years of service with the company. DAVID H. PAUL will take over Mr. Bell's territory, his headquarters being the Philadelphia, Pa., warehouse. Mr. Bell, who joined Norton in 1915, had represented this territory since 1926.

A. B. CAPRON, chief engineer of the Tubular Products Division of the Babcock & Wilcox Co., Beaver Falls, Pa., has been promoted to the post of assistant works manager in charge of the tube mills and engineering; and NEWELL HAMILTON, who was superintendent of the steel mill, has been named manager of steel operations in the Division.

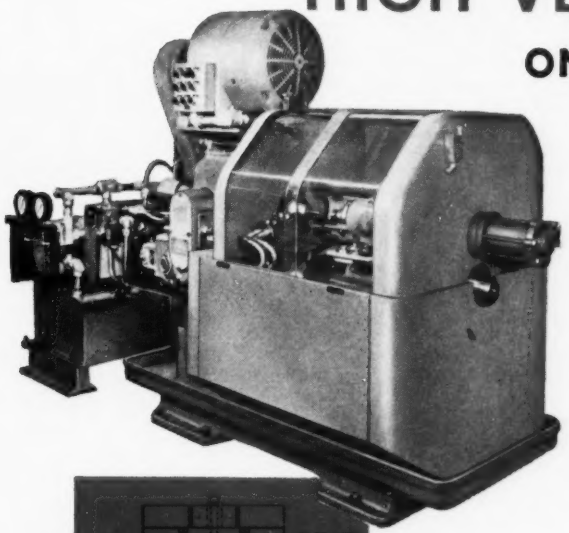
SEWARD H. FRENCH, JR., has been named vice-president of the Crucible Steel Company of America, Pittsburgh, Pa. Mr. French will be in charge of industrial and public relations. In 1947, he joined the company as assistant to the president in charge of industrial and public relations.

JUDSON NEFF has been named manager of manufacturing and production operations in the Pittsburgh and Midland, Pa., plants of the Mackintosh-Hemphill Co., Pittsburgh, Pa. Mr. Neff will also be manager of the engineering and estimating departments.

BOIARDI STEEL CORPORATION, Milton, Pa., announces that the firm name has been changed to MILTON ELECTRIC STEEL CORPORATION. The concern is a producer of electric furnace steel, hot-rolled bars, small shapes, and strip.

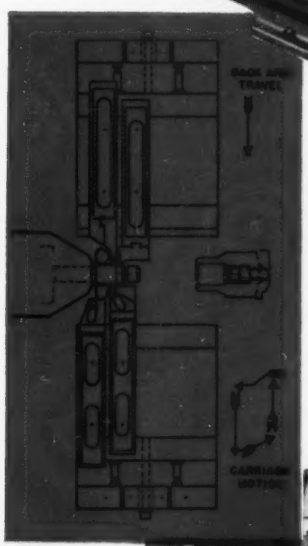
E. F. HOUGHTON & CO., Philadelphia, Pa., manufacturers of oils, chemicals, and hydraulic leathers, recently announced plans for an expanded research program, as well as a further addition to its laboratories.

AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS



SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

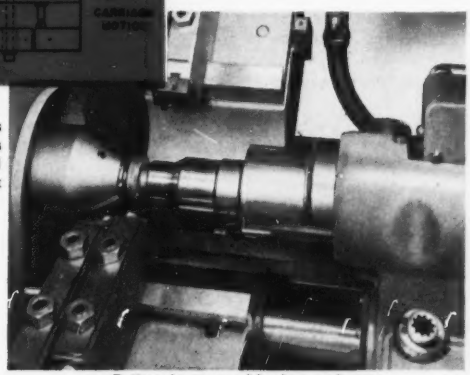
Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.



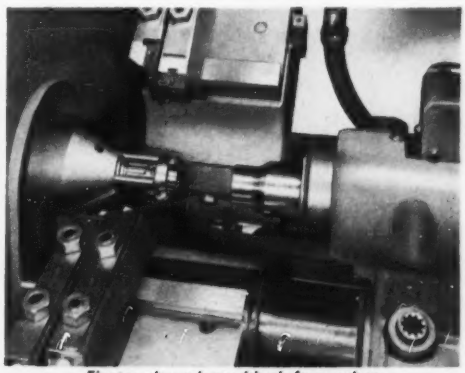
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

FAY LATHE DIVISION

(For more information on products advertised, use Inquiry Card page 245)

R-S PRODUCTS CORPORATION, Philadelphia, Pa., announces the incorporation of its Furnace Division, to be known in the future as the R-S FURNACE CORPORATION, a subsidiary of Hardinge Co., Inc.

A. J. JONES has been appointed chief engineer of the Landis Tool Co.,



A. J. Jones, chief engineer of the Landis Tool Co.

Waynesboro, Pa. Prior to this, Mr. Jones was in charge of sales engineering. He has been with the company for seventeen years.

Virginia, North Carolina, and Kentucky

HENRY WALKE Co., with offices in Norfolk, Va., and Charlotte, W. Va., has been appointed a distributor for the Carboloy Department of the General Electric Co., Detroit, Mich. L. F. PERKINS, vice-president and general manager, will direct the sale of Carboloy products in the Norfolk office, while P. A. NEWBERRY, sales manager, will represent Carboloy in Charlotte.

CALVIN W. TITTSLER has been named eastern and southern regional sales manager for the Deluxe Saw & Tool Co., High Point, N. C., a subsidiary of the Rockwell Mfg. Co., Pittsburgh, Pa. Mr. Tittsler was a service engineer with the company's Crescent Machine Division in Leetonia, Ohio, for the last thirteen years. His headquarters will be at High Point.

L. E. BLACKWELL, JR., has been named sales application engineer by the Reliance Electric & Engineering Co., Cleveland, Ohio, in the Charlotte, N. C., office.

C. B. HUNT & SON, INC., Salem, Ohio, valve manufacturer, announces the appointment of ALFRED HALLIDAY as sales representative for Kentucky, central and western Tennessee, northern Mississippi, and Arkansas. Mr. Halliday has offices at 317 Starks Bldg., Louisville, Ky.; 1509 Madison Ave., Memphis, Tenn.; and 916½ Henley Ave., Knoxville, Tenn.

Coming Events

OCTOBER 1-2—Third annual meeting of the NATIONAL ASSOCIATION OF ALUMINUM DISTRIBUTORS at the Broadmoor, Colorado Springs, Colo., Secretary, R. Bruce Wall, 1900 Arch St., Philadelphia 3, Pa.

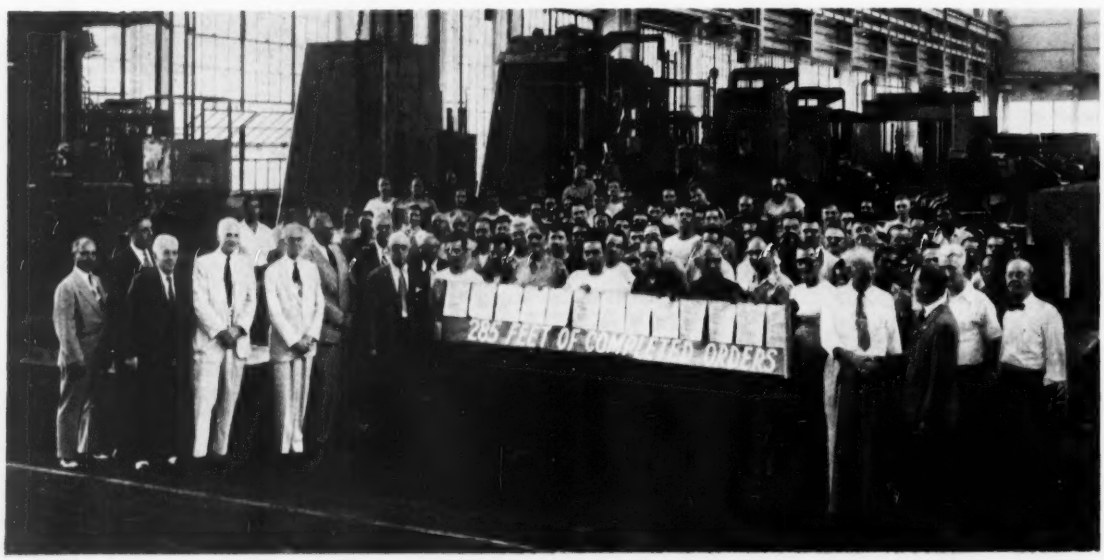
OCTOBER 5-7—Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Sheraton, Rochester, N. Y. Secretary, C. E. Davies, 29 W. 39th St., New York 18, N. Y.

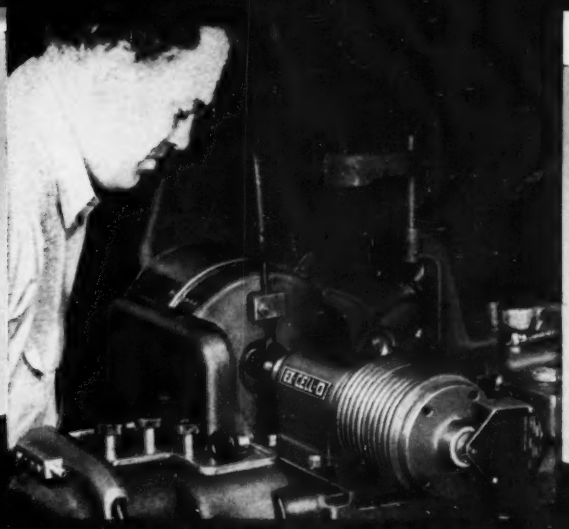
OCTOBER 6-7—First fall meeting of the NATIONAL FLUID POWER ASSOCIATION at the Sheraton Hotel, Chicago, Ill. Executive secretary, Barrett Rogers, 1618 Orrington Ave., Evanston, Ill.

OCTOBER 8-9—Eighth Midwest Conference of the AMERICAN SOCIETY FOR QUALITY CONTROL, to be held in the Masonic Temple at Davenport, Iowa. For further information write to Jack E. Meyers, International Harvester Co., Farmall Works, Rock Island, Ill.

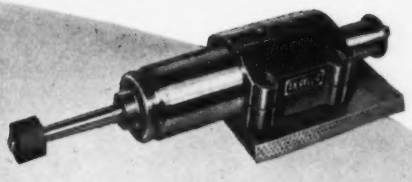
OCTOBER 8-9—Twenty-fifth Silver Anniversary meeting of the GRAY IRON FOUNDERS' SOCIETY, INC., at the Hotel Jefferson, St. Louis, Mo. For further information, write to W. M. Caldwell, Gray Iron Founders' Society, Inc., National City—East Sixth Bldg., Cleveland 14, Ohio.

Two hundred carloads of heavy machine tools with a total rating of 9000 H.P. have been shipped within the last eighteen months from Plant No. 2 of the Cincinnati Milling Machine Co. The plant was dedicated in February, 1952. Directors and officers of the company were present when President Frederick V. Geier congratulated the employes on their achievement.





Grinding small holes with an Ex-Cell-O 25,000 RPM High Frequency Motorized Spindle



Single-body, belt-driven internal grinding spindle.



Double-body, belt-driven internal grinding spindle.



25 hp heavy duty precision spindle with 24" grinding wheel.

PRECISION SPINDLES

Built for Your Work



25,000 rpm high frequency inbuilt motor spindle.



Totally enclosed inbuilt motor surface grinder spindle.



Precision inbuilt motor spindle for cutter grinder.



Heavy duty motorized precision spindle available up to 20 hp

Get the most from your precision grinding operations by using the Ex-Cell-O Spindle that's made especially for the job.

Ex-Cell-O Precision Spindles have long been the original equipment choice of leading grinder manufacturers. They are rigid and smooth-running. For high precision work they are fitted with standard Ex-Cell-O Precision Ball Bearings; for slower speeds and heavier cuts they are equipped with heavy-duty Ex-Cell-O Precision Ball Bearings. They require no lubrication or adjustment. Phone your Ex-Cell-O representative or write to Ex-Cell-O in Detroit today for catalog 25962 listing hundreds of standard grinding spindles.

53-32

XLO

EX-CELL-O PRECISION

EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

OCTOBER 14-16—Sixth Annual Conference on Machine Tools sponsored by the Sub-Committee on Machine Tools of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, to be held at the Cleveland Hotel, Cleveland, Ohio. General Sub-Committee Chairman, R. H. CLARK, Warner & Swasey Co., Cleveland 6, Ohio.

OCTOBER 16—Joint regional meeting of the AMERICAN SUPPLY & MACHINERY MANUFACTURERS' ASSOCIATION and the NATIONAL INDUSTRIAL DISTRIBUTORS' ASSOCIATION to be held at the Statler Hotel, Washington, D. C. For further information, write to American Supply & Machinery Manufacturers' Association, 814 Clark Bldg., Pittsburgh 22, Pa.

OCTOBER 19-23—Thirty-fifth National Metal Exposition and Congress of the AMERICAN SOCIETY FOR METALS to be held at the Cleveland Public Auditorium, Cleveland, Ohio. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 25-28—Semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION, to be held at Edgewater Beach Hotel, Chicago, Ill. John C. Sears, executive secretary, Empire Bldg., Pittsburgh, 22, Pa.

NOVEMBER 9-13—MONTREAL TOOL AND INDUSTRIAL EQUIPMENT SHOW, associated with Montreal Materials Handling Show, to be held at the Show Mart, Berri Square, Montreal, Canada. For further information, write to E. M. Wilcox, Manager, 19 Melinda St., Toronto, Canada.

JANUARY 25-28, 1954—PLANT MAINTENANCE AND ENGINEERING SHOW to be held at the International Amphitheater, Chicago, Ill. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

APRIL 26-30, 1954—Tenth Biennial Industrial Exposition of the AMERICAN SOCIETY OF TOOL ENGINEERS to be held at Convention Center in Philadelphia, Pa. Executive secretary, Harry E. Conrad, 10700 Puritan Ave., Detroit 21, Mich.

MAY 4-7, 1954—National spring technical meeting of the AMERICAN WELDING SOCIETY to be held at the Hotel Statler, Buffalo, N. Y. National secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

JUNE 7-10, 1954—Sixth National Plastics Exposition sponsored by the SOCIETY OF THE PLASTICS INDUSTRY, INC., at the Public Auditorium in Cleveland, Ohio. Chairman, P. H. Grunnagle, Society of the Plastics Industry, Inc., 67 W. 44th St., New York 18, N. Y.

Obituaries

Donald H. Montgomery

Donald H. Montgomery, vice-president and director of the New Britain Machine Co., New Britain, Conn., died after a short illness on August 13 at his home in Farmington, Conn., at the age of fifty-seven years. Mr. Montgomery was born in Waseco, Minn. He received his engineering training at the Massachusetts Institute of Technology, and then became associated with the National Acme Machine Co. as New England sales engineer. In 1927, he founded the Gridley Machine Co. in Hartford, Conn., with Earl Wheeler and George O. Gridley. This firm combined two years later with the machinery business of the New Britain Machine Co. to form the New Gridley Machine Co. In 1936, the firm



Donald H. Montgomery

was absorbed by the New Britain Machine Co. and Mr. Montgomery was named vice-president, member of the board of directors, and chief engineer, which positions he held until his death. Mr. Montgomery was well known in the machine tool field, and held many patents on machinery mechanisms. He is survived by his wife and three sons.

Alexander G. Bryant

Alexander G. Bryant, president of the Bryant Machinery & Engineering Co., Chicago, Ill., died at his home in Oak Park, Ill., of a heart attack on August 25 at the age of fifty-nine years. Throughout his entire business life, Mr. Bryant was active in the development of machine tools for the metal-working industry. He was vice-president of the Cleereman Machine Tool Co., Green Bay, Wis. Affiliated with the National Machine Tool Builders' Association and the American Machine Tool Distributors' Association, he was past president of both associations, and served on the Government Relations Committee of the N.M.T.B.A. until his death. Mr. Bryant is survived by his wife and two children.



Alexander G. Bryant

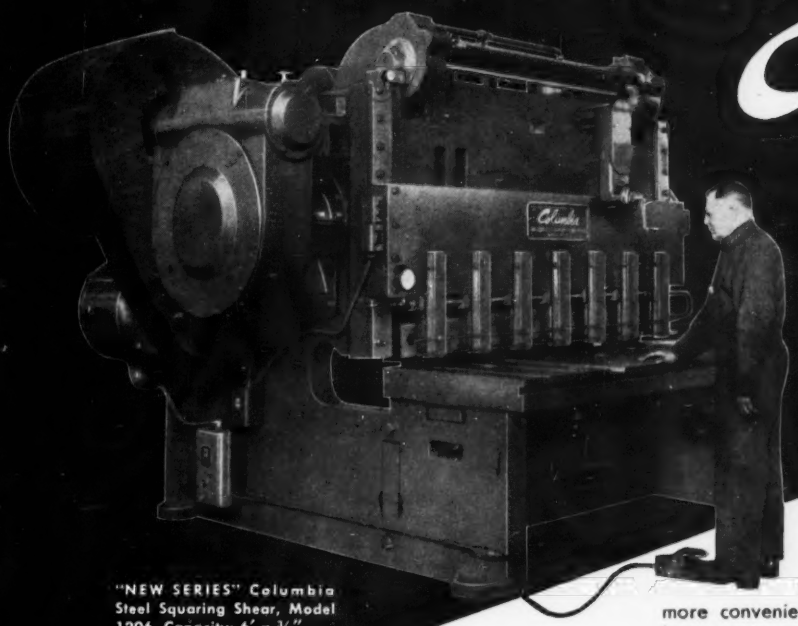
A. ALBERT KLEIN, assistant director of research and development at the Norton Co., Worcester, Mass., died suddenly at his home on August 25 at the age of sixty-four years. Mr. Klein was graduated from the University of Michigan in 1911, and then worked as assistant physicist at the United States Bureau of Standards until 1916. In this year, he came to Norton. During his thirty-seven years with the company, he served as petrographer, head of the microscopic section, and for the last ten years as research engineer. Mr. Klein was one of the country's leading authorities on abrasives, and did much work at Norton in improving abrasive grains. He was a member of the American Society for Testing Materials.

J. IRVIN SCHULTZ, vice-president and treasurer of the National Broach & Machine Co., Detroit, Mich., died on September 12 at his home at the age of forty-seven years. Mr. Schultz was born in Elkton, Mich., and attended Huron County schools and then the Detroit Business Institute. In 1933, he joined the National Broach & Machine Co. as controller. Six years later he became treasurer, and in 1946 was also made vice-president. Mr. Schultz was a member of the Engineering Society of Detroit.

5315

MAKE NO MISTAKE about it

Columbia builds BETTER shears!



"NEW SERIES" Columbia Steel Squaring Shear, Model 1206. Capacity: 6′ x ¾″.

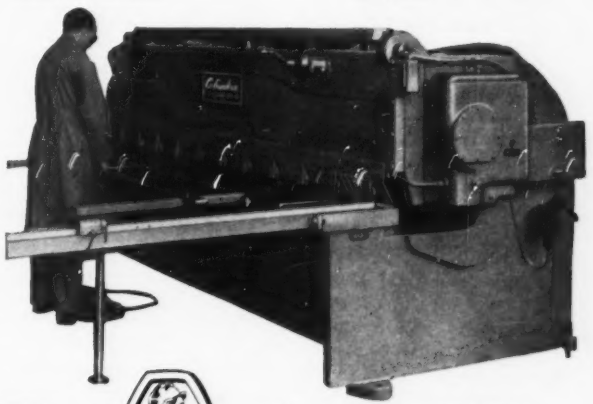
"NEW SERIES" Columbia SHEARS are more convenient in operation, more accurate and safer; incorporate more stamina, have a greater production potential. Consider that fact; and its implied benefits of longer tool life, easier maintenance, fewer repairs, more production, less scrap, fewer accidents!

AS A QUICK EXAMPLE of Columbia's better design take a look at the Columbia exclusive air clutch.

- ★ It reduces gear wear by as much as 75% through elimination of gear movement except in actual cutting cycle.
- ★ Application of power is soft. Shocks are not transmitted.
- ★ Inherent clutch slippage at overload point acts as automatic cut-off.

AND THE DESIGN IS RICH with parallel advantages. Such as the exclusive hydraulic holddown finger connections which contribute so much to the ease of holddown system maintenance; the special slitting provision which extends the capacity of the bed; the blade clearance setting gage, which makes blade clearance setting an "operator function."

Other capacities from 6′ x ¾″ to 6′ x 1¼″, 12′ x 1″, 14′ x ¾″, or 20′ x ⅜″ in mild steel.



DON'T FOLLOW BLIND PRECEDENT in the selection of your new shear. Don't risk the purchase of anything less than a modern Columbia tool. For the price is standard and delivery is often better.

FULL PARTICULARS WILL COST YOU only a minute of your time and the few cents required to mail your request. Don't delay! Even though your purchase of a shear may be a year or more away! Get the information now, and have it at hand when the need becomes urgent.

ASK FOR OUR FREE SHEAR CATALOG NO. 5315.
Address Columbia Machinery and Engineering Corporation, Hamilton 1, Ohio.

new series

Columbia STEEL SQUARING SHEARS and POWER PRESS BRAKES

Smooth Finish on Cutting Tools Not Required for Rough-Machining

The use of lapped or superfinished cemented-carbide cutting tools for rough-machining of steel is a waste of man-hours required to provide such a finish on the tools. According to Carboloy Department of General Electric Co., the surface finish on a carbide tool tip has little effect on tool life for the average machining of steel. It is pointed out that during roughing operations carbide tools perform satisfactorily whether they are ground on a diamond or silicon carbide grinding wheel—or even if left with the surface in an as-sintered condition.

As-sintered carbide tools have a surface finish of 30 micro-inches, or more. Those ground with silicon carbide abrasive wheels have a finish of 15 micro-inches or more. A surface finish of 8 to 15 micro-inches can be produced with diamond grinding wheels, while lapping and superfinishing can reduce this to 0.5 to 5 micro-inches.

Tests conducted at Carboloy Department indicate that a lapped or superfinished tool fails more rapidly in making roughing cuts than one ground on a diamond wheel. This is because the lapped surface over which the chip slides offers more area contact, increasing both the rate of heat transfer from chip to tool tip and friction due to sliding. A slightly rougher tool surface results in less contact and lower temperatures.

Tools employed for finish-machining aluminum, magnesium, and similar materials, however, must have a good surface finish. Lapping of the top face and cutting edges is essential for tool life. For precision finishing of steel, it is necessary to finish-grind the tool cutting edges with a diamond wheel. Long-run jobs, using quick-change toolholders, require the use of a duplicating type grinder to control uniformity of the cutting tool shape. These duplicating grinders often use a 400 grit, resinoid-bonded, diamond wheel. In such operations, however, very little stock is removed since it is more of a truing operation. Rough-grinding of precision finishing tools may be done by off-hand grinding with a 100-grit silicon carbide or diamond wheel.

* * *

Single Cold-Formed Parts Save Assembling Costs

Many small units consisting of two or more assembled parts are used in the machine-building industries which could be profitably replaced by single cold-formed parts. Often such changes can be made with very little redesigning of the part or parts to be replaced. Comparatively small changes of this kind, however, may result in large savings in production costs, especially when the parts are required in great quantities.

In the case of the two-piece worm-gear type clamping screw shown in the views at the left in the accompanying illustration, the change to a single cold-formed screw like the one shown at the right resulted in reducing the George K. Garrett Co.'s cost of assembling special hose clamps by more than one-third.

The two-piece screw, as shown by the two lower views at the left, consists of the worm-gear type screw and a brass collar. The brass collar is designed to fit around the screw head and prevent a screwdriver from slipping out of the slot when applying or adjusting the clamp. While this two-piece screw functioned very satisfactorily, investigations showed that an equally desirable single-piece screw with a closed-end slot could be cold-formed by the Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y. In addition to the saving in assembling costs realized by changing to the cold-formed screw, the cost of the brass collars was also eliminated.



Special hose clamp shown at left has two-piece assembled clamping screw which has been replaced with considerable savings in production costs by using single cold-formed screw shown in lower right-hand corner.

* * *

Sound Slide Films Available from Sheffield

An interesting and informative series of automatic sound slide films has just been completed by the Sheffield Corporation. They are available for showings by schools, colleges, and other educational institutions, as well as for meetings of industrial groups and technical societies. Arrangements for securing the films may be made by writing direct to the Sheffield Corporation, Dayton 1, Ohio.

One group of films includes "Precision for Production," "Air for Every Gaging Job," and "Report from Industry," all dealing with the various applications of air gages. Another series—"The Crushtrue Process," "The Microform Grinder," and "The Thread and Form Grinder"—cover the latest developments in form and thread grinding. There are three films, "Murchey Precision Pak," "Murchey Tangent Die Heads," and "Murchey Type L Collapsible Taps" that reveal many applications of products manufactured by the Murchey Division of the Sheffield Corporation. In addition, there are two educational films, "The Advance Guard" and "Why Gamble in Gages," covering the various types and kinds of services offered to industry by Sheffield to solve problems in inspection and precision manufacturing.



CLEARING Harvests a Bumper Crop

One million bumpers a year are supplied to Western automotive assembly plants by United States Spring & Bumper Co., Los Angeles. A husky reason for this production is the 1900 ton Clearing double action press, shown here, which forms up to 300 bumpers per hour from stock up to .120" thick.

Specializing in the volume production of heavy-duty steel parts, United States Spring & Bumper Co., utilizes Clearing press equipment for many of its operations. If you have a similar job to do, follow the lead of the masters of mass production, specify Clearing. The assistance of Clearing press engineers is at your service. Get in touch with them today.

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CMC

CLEARING MACHINE CORPORATION, 6496 West 65th St., Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio

(For more information on products advertised, use Inquiry Card page 245)

you have precision problems, too!

As swift technical advances are made, they bring new and interesting production problems. That illustrated is a good example. Axelson, with its experienced designers and engineers, is assisting more and more firms in the solution of their metal turning problems. Axelson lathes are well known for their ability to sustain heavy loads over long periods, to produce precision work with accuracy. Axelson designers and engineers contrive special attachments that answer Industry's need for intricate work. If you want a solution to the problem worrying you, get in touch with Axelson or your nearby Axelson representative.

Write for Axelson Lathe Bulletin #5304.

Chosen first....to last! **AXELSON** *Lathes*

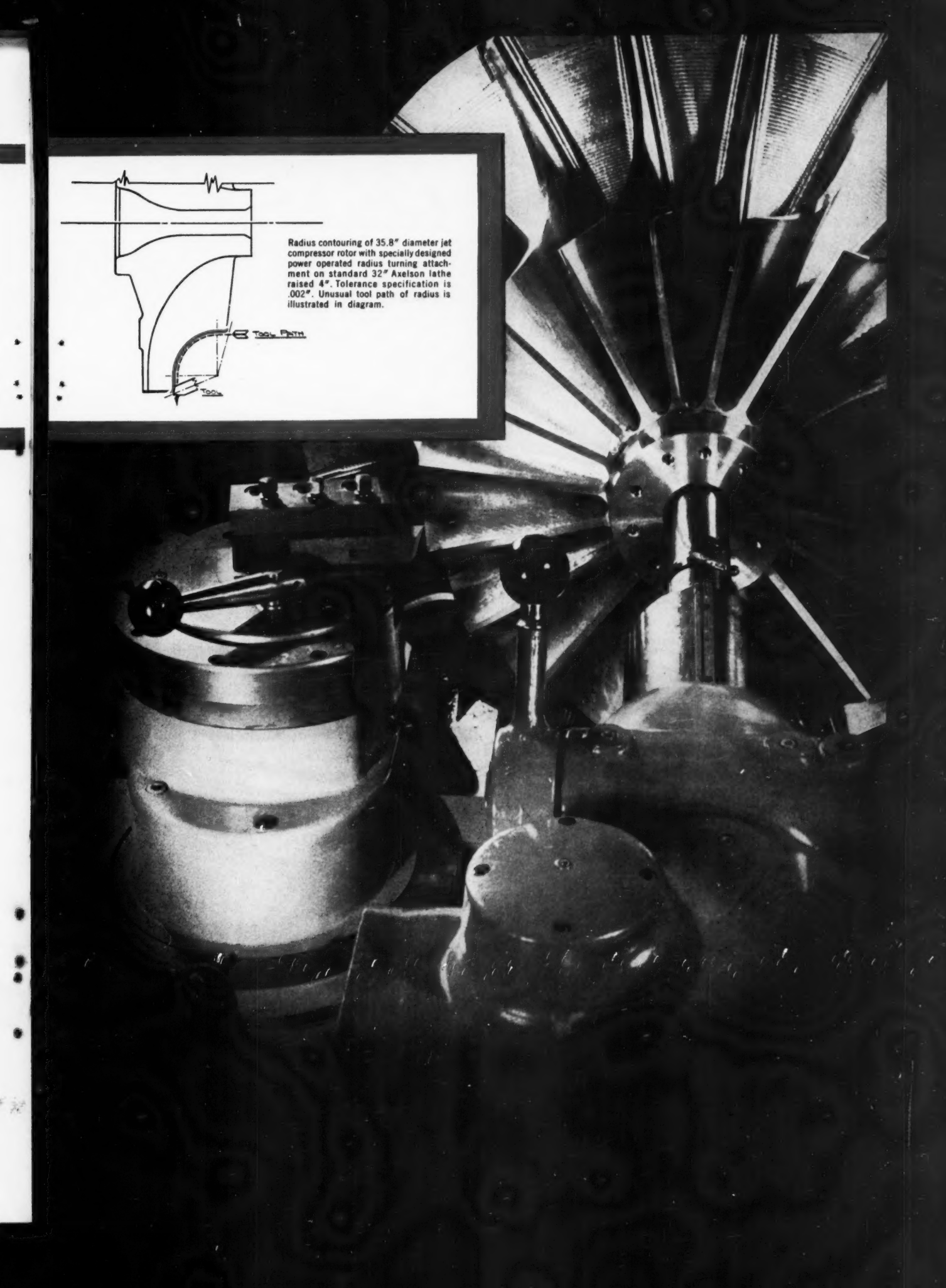
THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

TOOL ROOM LATHES • GAP BED LATHES • HEAVY DUTY ENGINE LATHES

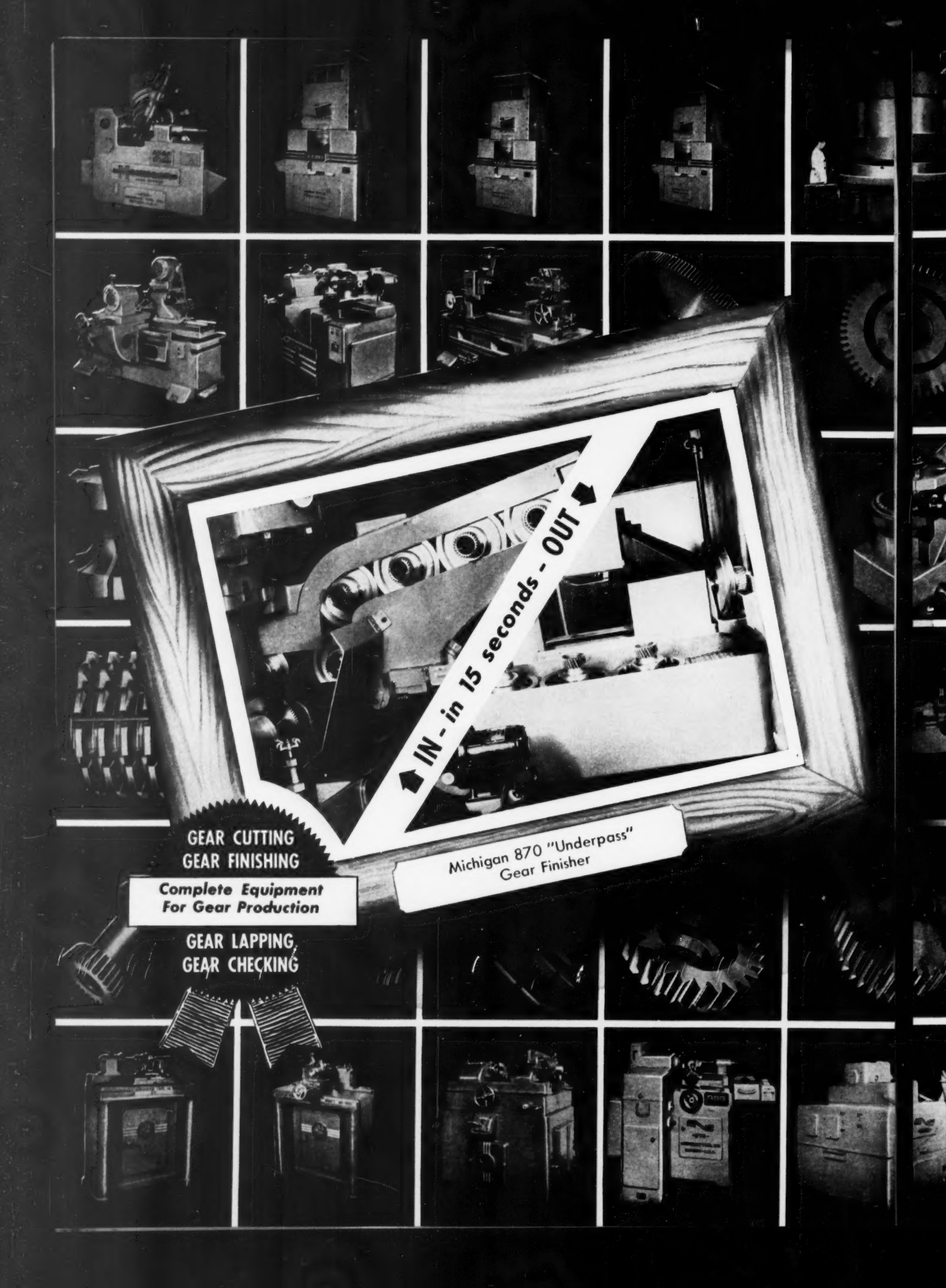
AXELSON MANUFACTURING COMPANY • Division of Pressed Steel Car Company, Inc. • Los Angeles 58 • New York 7 • St. Louis 18

Authorized Distributors in All Principal Industrial Centers

(For more information on products advertised, use Inquiry Card page 245) L 31



Radius contouring of 35.8" diameter jet compressor rotor with specially designed power operated radius turning attachment on standard 32" Axelson lathe raised 4". Tolerance specification is .002". Unusual tool path of radius is illustrated in diagram.


IN - in 15 seconds - OUT
Michigan 870 "Underpass" Gear Finisher
GEAR CUTTING
GEAR FINISHING
Complete Equipment For Gear Production
GEAR LAPPING
GEAR CHECKING



AUTOMATIC SETUP SHAVES 4 GEARS per minute

This *standard** Michigan 870 "Underpass" gear finisher *—with automation—*shaves 240 shoulder gears per hour. The 27-tooth helical gears are 2.0257" pitch diameter with 0.734" face width. The shoulder flange is 6.250" O.D.

Completely automatic operation keeps production in high gear. The operator only loads the hopper. Even pre-inspection is automatic: *A sizing fixture at the hopper mouth rejects oversize gears.*

From the hopper an air cylinder feeds parts into shaving position, one at a time. An air operated expanding mandrel clamps the gear, holds it during "Underpass" shaving (the fastest precision shaving method known), and automatically releases the gear at the end of the machine cycle.

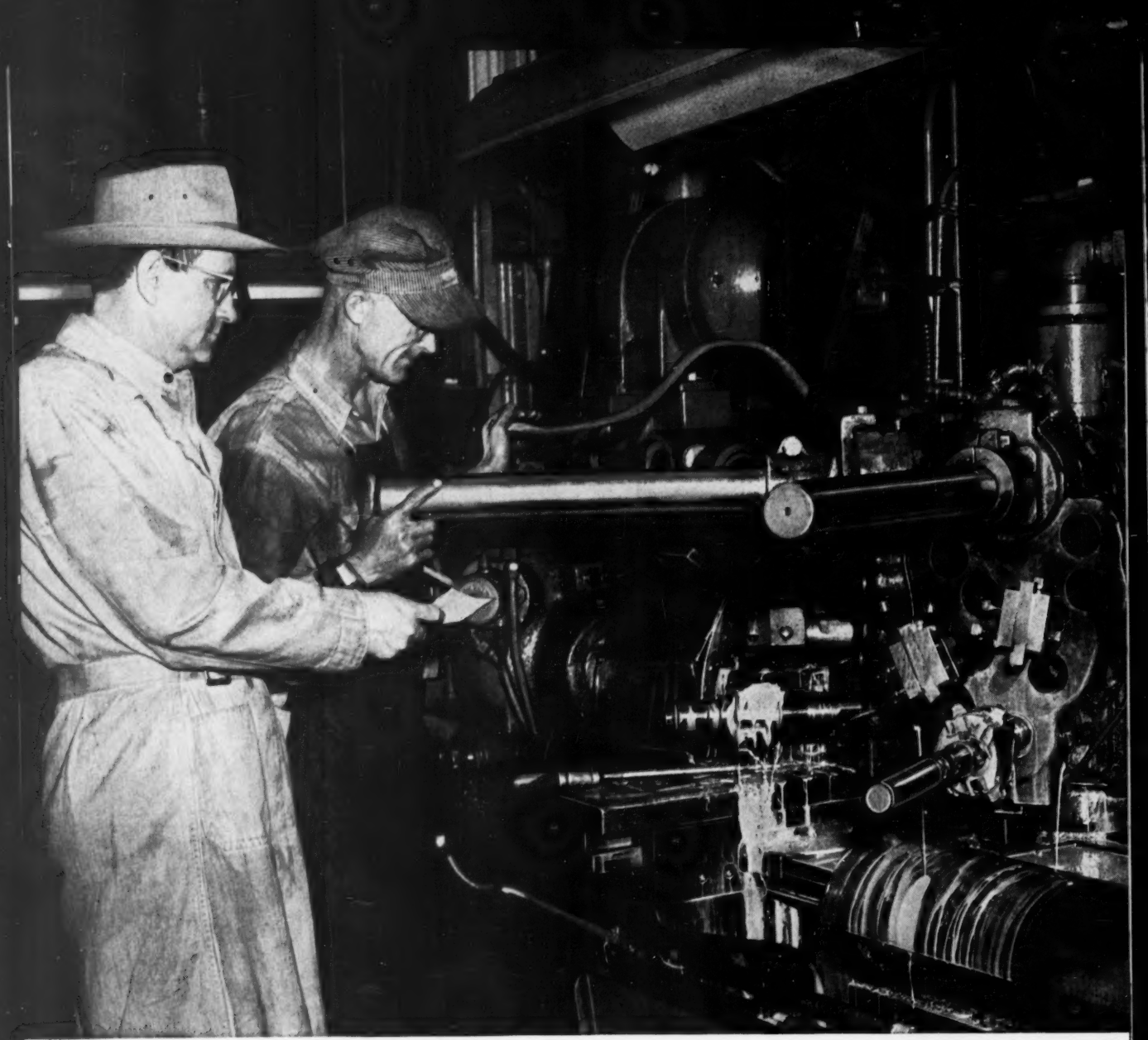
Ejection, too, is automatic. The flange of the incoming gear pushes against the flange of the shaved gear and rolls it down a trough where it gently lays over, flange down, on a wire mesh conveyor used to transfer the gear to the next operation.

**Should the automation-equipped machine be needed for shaving other gears, it may be converted to a standard operation by removing the automatic loading mechanism and controls.*

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL CO. — from blank to finished gear — COMPLETE EQUIPMENT

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.



The Four Wheel Drive Auto Co. benefits 4 ways with

SUPERLA
REG. U. S. PAT. OFF.
Soluble Oil

• Over a period of nearly 40 years, the Four Wheel Drive Auto Co., Clintonville, Wisconsin, has used SUPERLA Soluble Oil on an increasing variety of machining jobs. Shown above is a current operation performed on a semi-automatic turret lathe. The job calls for boring and turning of 1040 steel to produce differential case assemblies.

Company officials report that on this job, as on many other jobs employing milling machines, drill presses, and grinding machines, SUPERLA Soluble Oil has provided these four important benefits: **1.** Mixes readily with cold water. **2.** Forms stable emulsions. **3.** Helps hold close clearances and dimensions. **4.** Helps provide good finish and tool life.

The long and successful experience of the Four Wheel Drive Auto Co. with SUPERLA Soluble Oil testifies to the benefits you can obtain with this outstanding coolant.

The Standard Oil lubrication specialist serving your area of the Midwest has a complete line of metalworking fluids and compounds to offer you. He also has the experience and training to help you use these products most effectively. You can reach this man by phoning your local Standard Oil (Ind.) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

What's YOUR problem?



R. E. O'Brien, of Standard Oil's Green Bay office, is the lubrication specialist who works closely with the Four Wheel Drive Auto Co. to assure maximum benefits from the use of SUPERLA Soluble Oil.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert and thorough attention to your lubrication problems.

A phone call to your local Standard Oil Company office will bring this man quickly to your plant—with no obligation to you, of course.

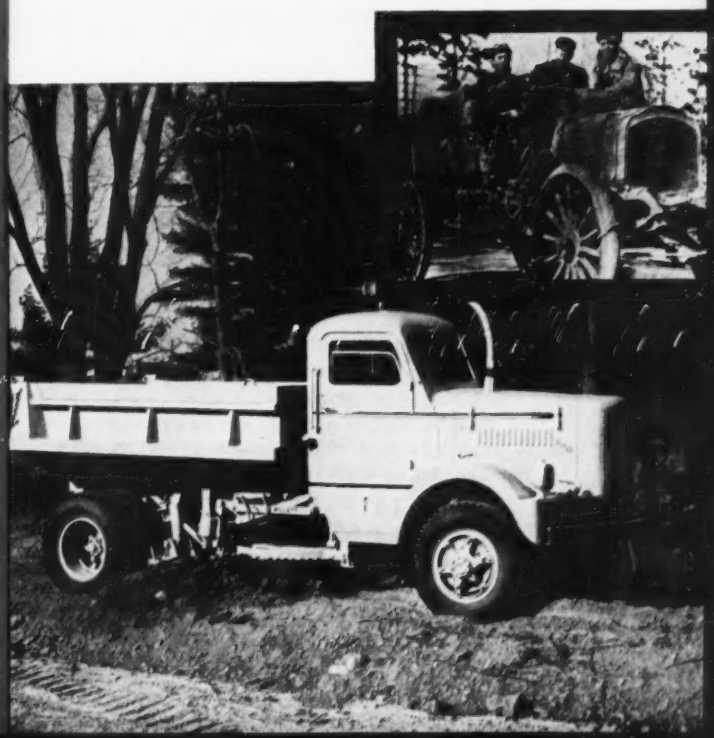
STANDARD

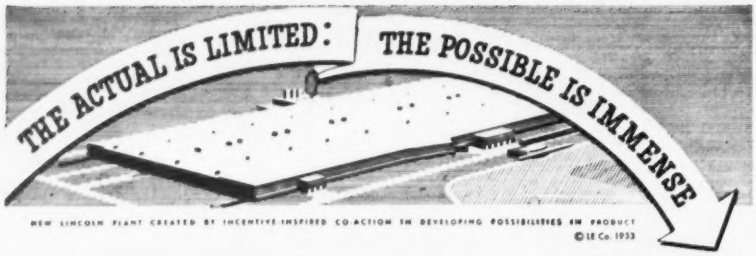
STANDARD OIL COMPANY
(INDIANA)



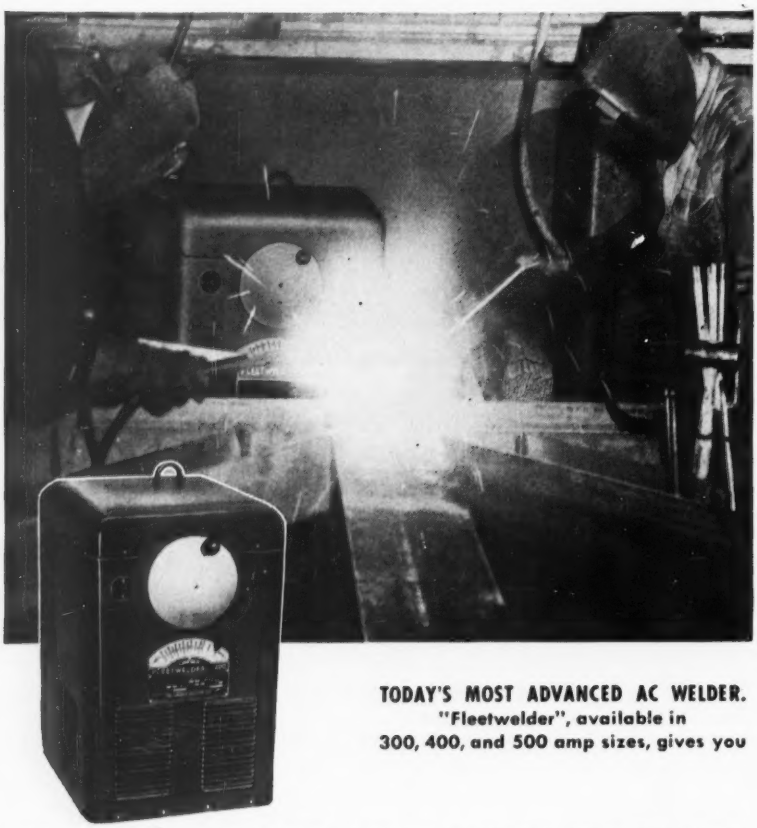
Nothing succeeds like service!

These illustrations, contrasting the past with the present, show dramatically the progress made by the Four Wheel Drive Auto Company since its organization in 1910. Service to the nation, through two world wars and in an era of great growth and progress, has won an impressive success for this company. Service, too, has won for Standard Oil an acceptance by the Four Wheel Drive Auto Company that now extends over a period of nearly 40 years.





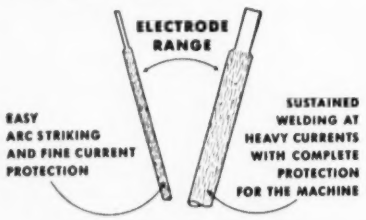
NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT
©LE Co. 1953



TODAY'S MOST ADVANCED AC WELDER.
"Fleetwelder", available in
300, 400, and 500 amp sizes, gives you

EXTRA RANGE TO SAVE EXTRA DOLLARS
on light and heavy work

LOOK at the sketch. It shows *how* you benefit through "Fleetwelder's" wide current range in which maximum welding currents are 15 times minimum current values.



This *extra range* teamed with "Fleetwelder's" exclusive "Arc-Booster" insures fine currents *with instant arc striking* for light gauge jobs while with the same welder you have ample amps for sustained welding at high currents.

No other AC welder offers this cost cutting combination . . . and at such low cost.

INVESTIGATE "FLEETWELDER" TODAY—See what new advancements in faster, more efficient welding are being put to use by Lincoln to simplify and speed your operations and cut your welding costs.

SEND FOR FREE BULLETIN 1314 *on "Fleetwelder". Available by writing on your letterhead to Dept. 1208.*

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

11 WAYS to cut AC welding costs

DESIGNED for faster, simpler, more efficient welding, Lincoln's "Fleetwelder" saves money on every AC job. Here's how:

1. SELLS FOR LESS—Built with Lincoln incentive production methods, "Fleetwelders" low selling price gives *more range, longer service, easier, faster operation, greater dependability* for the dollar . . . to cut your AC welding costs.

2. Complete Overload Protection—Built with *generous* reserve capacity for long sustained output at high currents, "Fleetwelder" is *completely protected* against damage due to overheating *by a thermostatic controlled magnetic starter . . .* a feature exclusive with Lincoln.

3. Exclusive "Arc-Booster"—Pioneered by Lincoln, the exclusive "Arc-Booster" blasts the end of the electrode with extra amps for an instant when the electrode touches the work to start the arc automatically. Ideal in out-of-position welding.

4. Completely Safe—No high frequency devices as on some welders to help arc starting. Open circuit voltage is only 71 volts. Output terminal panel recessed to eliminate accidental shorting of leads.

5. "Low Voltage" Safety Relays available for special work. (Optional extra.)

6. Takes Less Power—"Fleetwelder" draws less amps in idle current than required for other AC welders. Inbuilt power factor is higher. Has pilot light to indicate power is on.

7. Low Maintenance—Ventilated from the top, "Fleetwelder" operates cleaner . . . needs less attention. Coils are permanently anchored, cannot become loosened to wear the insulation and short out. Easy accessibility to all working parts.

8. Current Stays Set—Once set, current settings do not change . . . are "locked" in position by rugged drum type holding devices. Illuminated dial shows setting of welding current.

9. Steady Arc—"Fleetwelder's" reactor control is a free circuit designed for high responsiveness to changing arc conditions.

10. Compact, Portable—Only 35" high, 22" x 26" at base, "Fleetwelder" requires less space. Has connection for simple hookup to 220 or 440 volt line. Can be furnished with three wheel undercarriage for moving around the shop.

11. Instant Penetration—The extra current for arc striking also gives *complete penetration* at once . . . no more cold overlaps or partial penetration at the start of the weld.

(For more information on products advertised, use Inquiry Card page 243)

Ask your Distributor



Photograph by Paul Davis

The extra quality built into every Butterfield tap
pays off on your production line.

B U T T E R F I E L D

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

TAPS • DIES • REAMERS • DRILLS • COUNTERBORES • SCREW PLATES



Photograph by Paul Davis

TAPS *by* CARD

Built into every Card tap are years of concentration on one ideal — to build the best taps money can buy.

Completely stocked offices at Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle.

See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. CARD Quality **TAPS • DIES • SCREW PLATES**

UNION



Unretouched Photograph
by Morton Berger

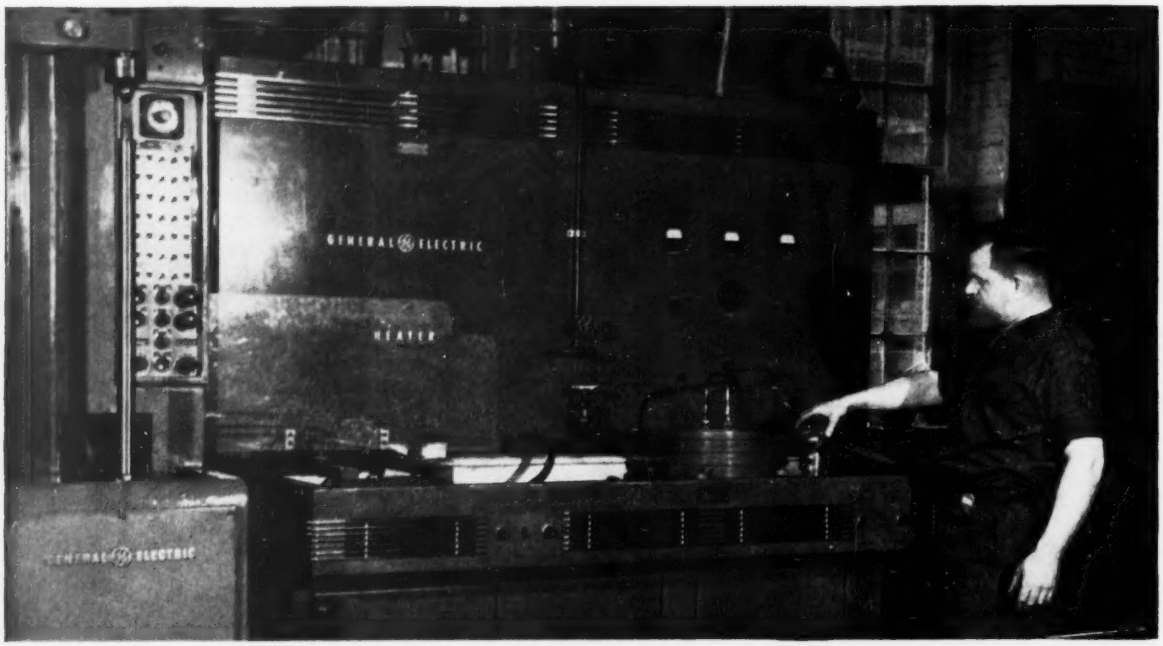
Perfectly designed for its job . . . .

Union's long experience in the cutting tool field reflects itself in the excellent performance of every tool it makes.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: **S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.** TAPS, DIES, SCREW PLATES
BUTTERFIELD DIVISION, Derby Line, Vermont DRILLS, TAPS, DIES, REAMERS, COUNTERBORES, SCREW PLATES
BUTTERFIELD DIVISION, Rock Island, Quebec MILLING CUTTERS, TWIST DRILLS, HOBS, REAMERS, TAPS, DIES, SCREW PLATES



INDUCTION HARDENING TEXTILE-MACHINE PARTS AT WHITIN MACHINE CO.

Hardening Output Increased Ten Times With G-E Induction Heaters

"Since changing to General Electric induction heaters for hardening twister rolls we've increased our hardening output ten times and improved product quality!" reports Arno Wagner, heating engineer, Whitin Machine Co., Whitinville, Mass.

When using cyanide furnaces for hardening, it took Whitin 3½ hours to harden only 11 rolls. Now, by applying selective G-E induction heat, Whitin hardens over 35 rolls per hour! Because parts require no expensive preparation for heating—necessary with furnace hardening—Whitin has reduced costs significantly. Hardness tests show induction-hardened rolls to be stronger and of more uniform hardness.

Improved working conditions are another benefit now enjoyed by Whitin, because compact G-E heaters eliminate the discomfort of radiant heat and provide cleaner, more comfortable working conditions.

Included in Whitin's heating operation are one 50-kw and three 20-kw G-E heaters. Used primarily for hardening over 500 parts for textile machines, these versatile heaters are also applied for annealing, soft soldering, and silver soldering. In each case, substantial savings in time and money have resulted.

This high-quality selective heating at lower cost is available to you. To learn how you can profitably apply G-E induction heat to your operations, contact your G-E Apparatus Sales representative. And write now for bulletins on G-E induction heaters to General Electric Co., Section 720-118, Schenectady 5, N. Y.



PROGRESSIVE HARDENING twister roll in this G-E fixture is done automatically at the rate of two inches per second.



SURFACE HARDENING machine part is a fast process. Only 20 seconds are required to harden, quench, and remove part.

You can put your confidence in—

GENERAL ELECTRIC

(For more information on products advertised, use Inquiry Card page 245)



KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Kearney & Trecker offers NEW FREE BOOK on solutions to production metalworking problems

THIS illustrated booklet will show you how to make profitable use of our Special Machinery Division's new $5,200,000 expansion. In addition to demonstrating how to use our Customer Engineering Service, the book illustrates typical special machines and tooling already built... the more than $2,000,000 worth of equipment available to work on the machines you need. Fill out and mail this coupon today. There's no obligation, of course.

SPECIAL MACHINERY DIVISION
Kearney & Trecker Corporation
6784 W. National Ave., Milwaukee 14, Wis.

Please send me a copy of the booklet "Doorway to a Proven Method for Solving Big and Small Metalworking Problems."

Name_____

Title_____

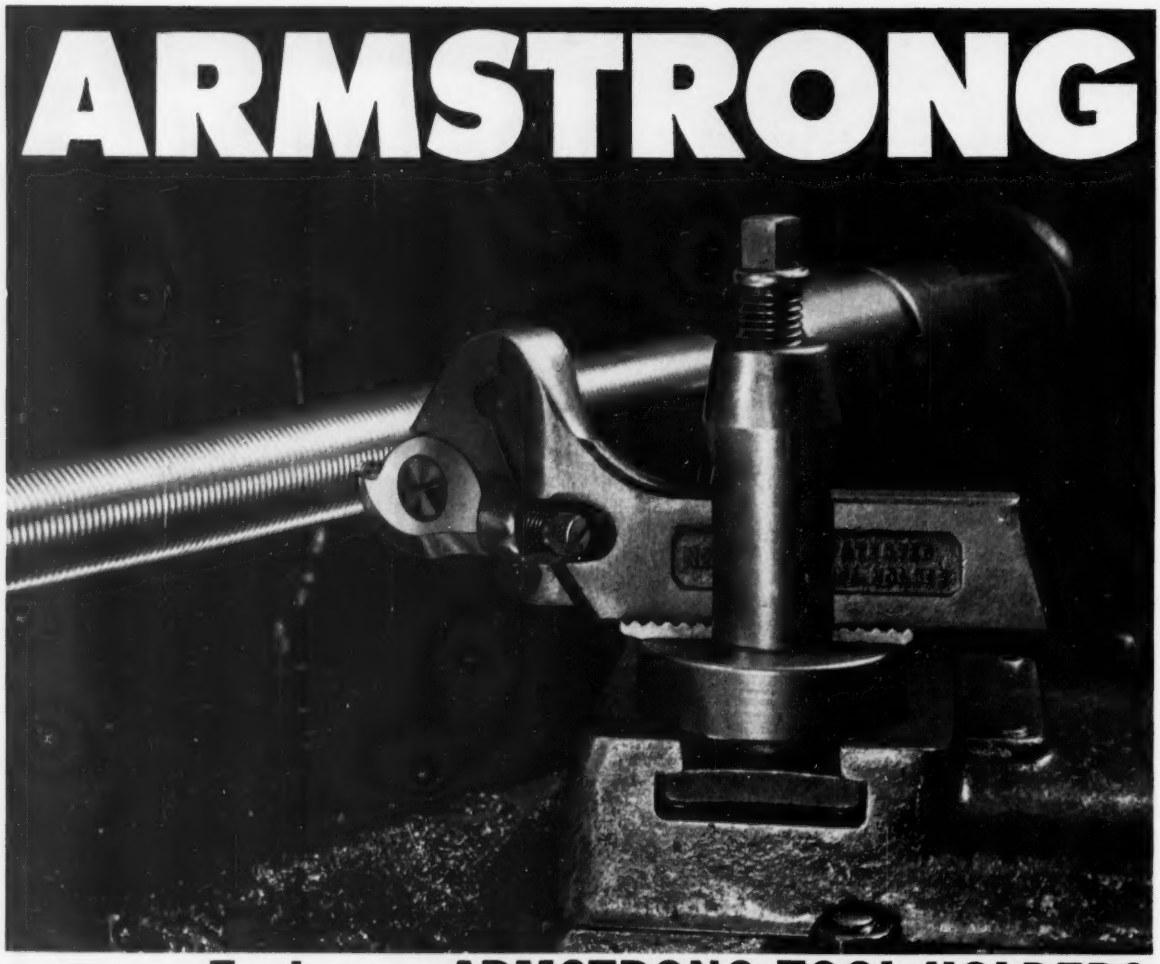
Company Name_____

Address_____

City_____ Zn_____ State_____

(For more information on products advertised, use Inquiry Card page 245)

ARMSTRONG





The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy **ARMSTRONG TOOLS** from your Industrial Distributor

ARMSTRONG BROS. TOOL CO.

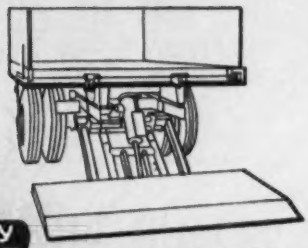
"The Tool Holder People"

5213 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

(For more information on products advertised, use Inquiry Card page 245)

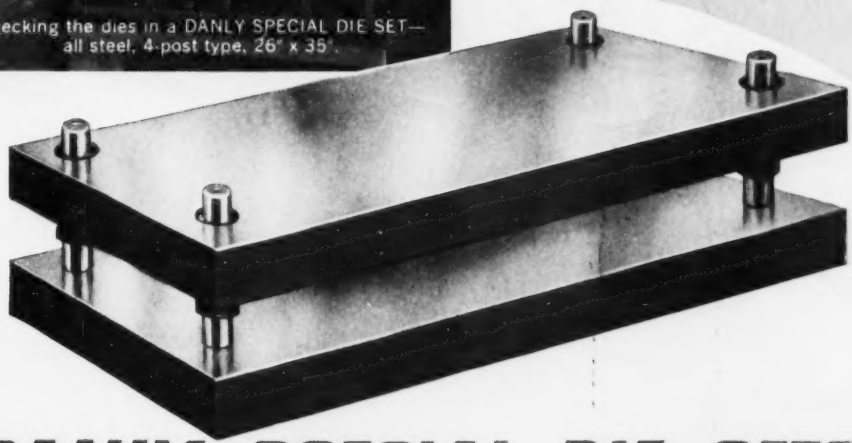


Checking the dies in a DANLY SPECIAL DIE SET—all steel, 4-post type, 26" x 35".

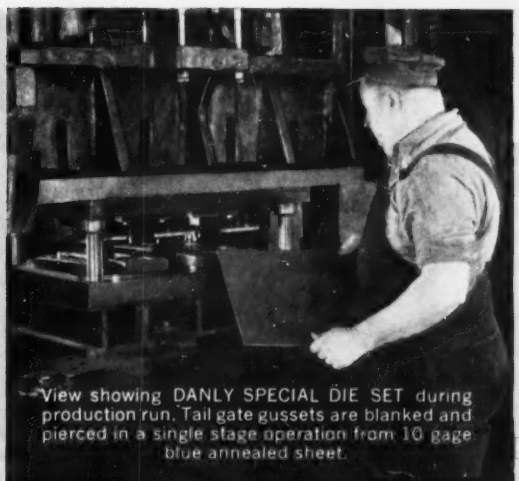


ANTHONY LIFT GATE HYDRAULIC

SHOWN IN LOADING POSITION



DANLY SPECIAL DIE SETS



View showing DANLY SPECIAL DIE SET during production run. Tail gate gussets are blanked and pierced in a single stage operation from 10 gage blue annealed sheet.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

help Anthony give industry a lift!

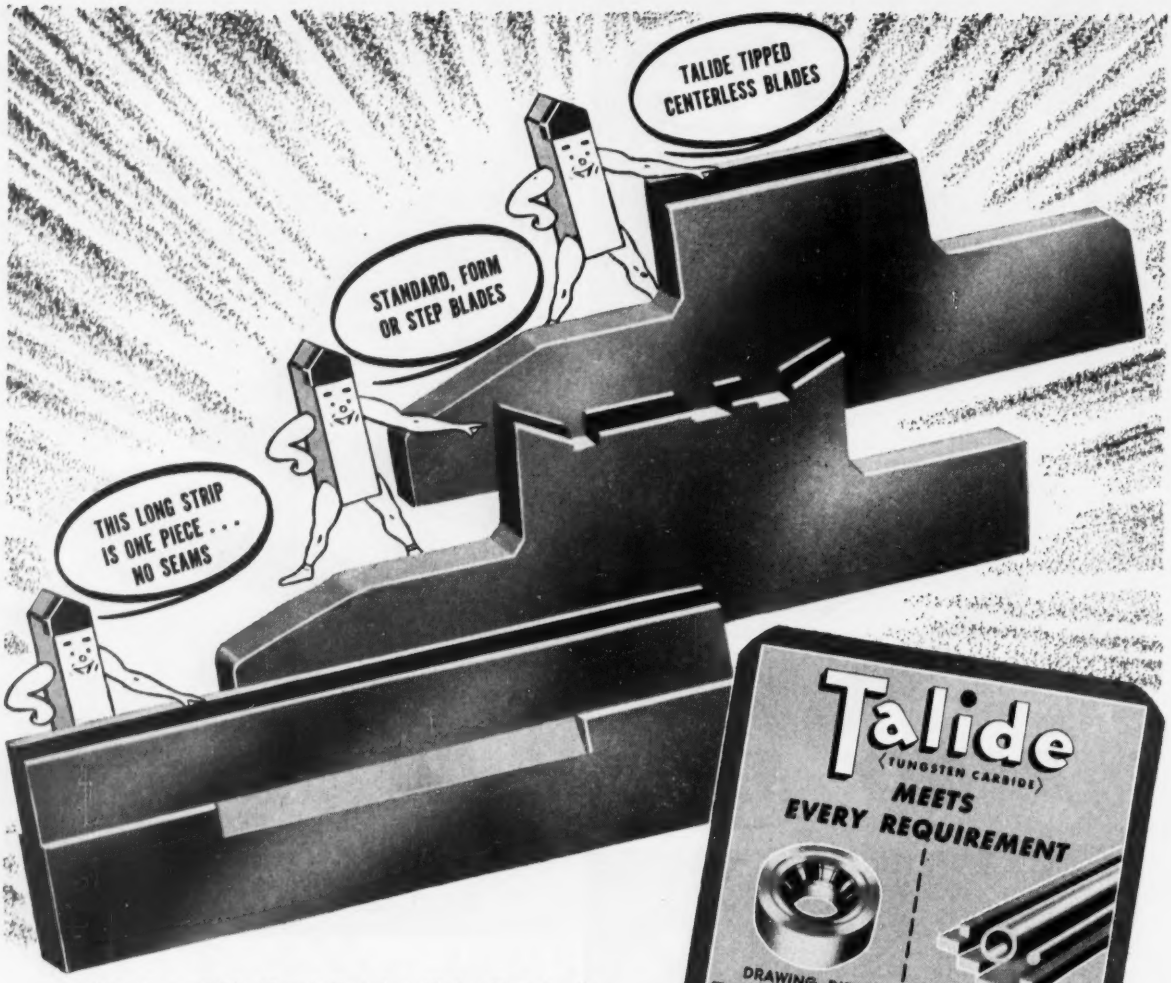
For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

***CHICAGO** 50	2100 South Laramie Avenue
***CLEVELAND** 14	1550 East 33rd Street
***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
***LONG ISLAND CITY** 1	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
***PHILADELPHIA** 40	511 W. Courtland Street
***ROCHESTER** 6	33 Rutter Street

*Indicates complete stock



The above **Talide Tipped Centerless Blades** illustrate the wide range and variety of work supports we make. In addition to standards, you may need blades for grinding multiple diameters, steps, tapers, contours or special shapes. You can obtain any shape or size of blade required for your centerless grinders from our extensive stocks or engineering files.

As a production man or designer, you are familiar with the advantages of **Talide Carbide.** This super-hard metal outwears any conventional material as much as 50 times. Notice, too, the long one-piece strip (up to 100") which eliminates chance of scratching or marring expensive ground and polished parts.

You can obtain **Talide Centerless Blades** on same day or 24-hour service from our warehouses in Newark, Youngstown, Detroit or Chicago.

Write Metal Carbides Corporation, Youngstown 7, Ohio.





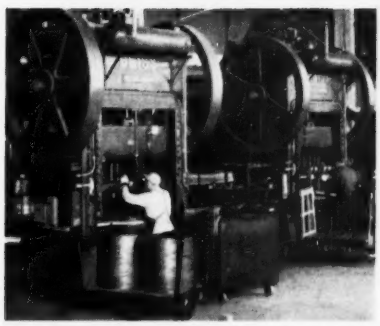
For special blades, send us prints direct to Youngstown. Prompt quotations.

New Blade Catalog 52-G *available upon request.*

(For more information on products advertised, use Inquiry Card page 245)

Punching 7,000 holes in 90 seconds with the BLISS perforating press!

Each hole precisely located and burr-free on wrap-around stamping for Lovell dryer



TWO NEW BLISS S-2 PRESSES team up at Lovell. Each has 175 tons capacity. At left: forming a dryer inner drum head. At right: piercing a cylindrical exhaust duct.

Take a sheet of 0.037 steel, 19" x 77", then pierce out 67% of the area with 7,000 precise perforations. And do it continuously day in and day out at the rate of one every 90 seconds. That's how Lovell Manufacturing Co., Erie, Pa., produces its dryer wrap-around stamping with a Bliss No. 875 High Speed Perforating press. Average speed is 160 strokes per minute with a 64 punch tool.

Press accuracy and rigidity are extremely important to insure exact alignment of the comparatively fragile punches. A specially-designed Bliss feeding mechanism, built-in safety devices and accurate back gages guard against miscuts.

But dependable press performance is not unusual at Lovell. For Bliss presses have been their first choice since 1918. Today, 66% of Lovell's stamping equipment is Bliss-Built. As Tool Superintendent Raymond F. Neider points out, "Our Bliss presses have stood up well under steady operation—often through double shifts. They are rugged, yet easy to operate and maintain. But then they have to be good or we couldn't depend on them as we do."

Next time you have a pressed metal problem, ask Bliss to specify the *right* press for *your* operation. They did it for Lovell and thousands of others.

BLISS on your press is more than a name... it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. Branch Offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other representatives throughout the world.

THE JOBS PROVE IT

YOU RETRENCH ON STAMPING COSTS WITH HENRY & WRIGHT DIEING MACHINES

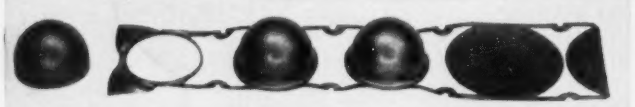
In the small area occupied by a compact Henry & Wright Dieing Machine you have a production tool equal in capacity to five or ten conventional presses. Progressive stamping on a Henry & Wright really pays off, because this press is specifically designed for this type of work.

Angular thrust is not transmitted to the upper crosshead. Low center of gravity holds vibration to an absolute minimum. Long ways, plus four post guidance and a pulling instead of pushing stroke, serve to strait-jacket punch travel. Accurate punching produces high quality work and a lot more of it between die grinds. Much less metal is removed when dies are ground.

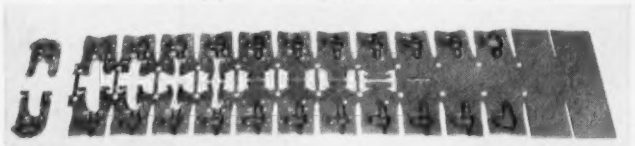
Get the whole story about the Henry & Wright Dieing Machine – the economies you achieve in die life, inspection, toting, operators. Retrench by modernizing with Henry & Wright.



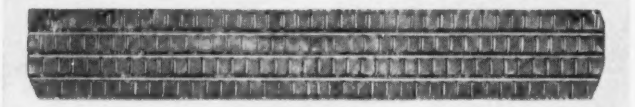
Refrigerator part produced at speed of 65 strokes per minute of .060" cold rolled steel on 100-ton Dieing Machine.



Hemispherical shell 2" deep produced at speed of 60 strokes per minute.



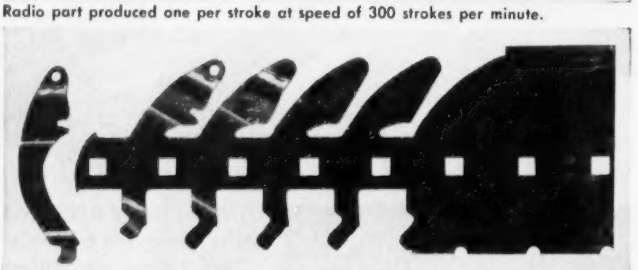
Paired sections of housing produced of .065" hot rolled steel at 60 pairs per minute.



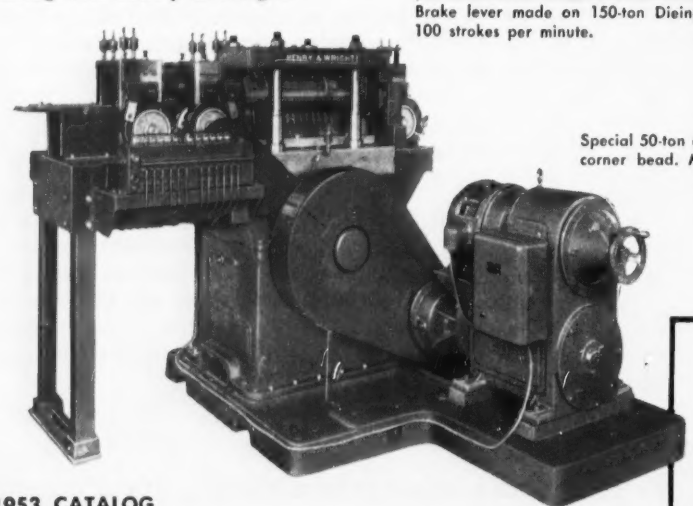
Radiator fin of copper made three at a time at speed of 85 strokes per minute.



Radio part produced one per stroke at speed of 300 strokes per minute.



Brake lever made on 150-ton Dieing Machine operating at speeds in excess of 100 strokes per minute.



Special 50-ton dieing machine for production of expanded corner bead. Machine operates 620 strokes per minute.



1953 CATALOG

Write for your copy on company letterhead to Henry & Wright, Division of Emhart Mfg. Co., 461 Windsor St., Hartford, Conn.

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

Only the best is good enough

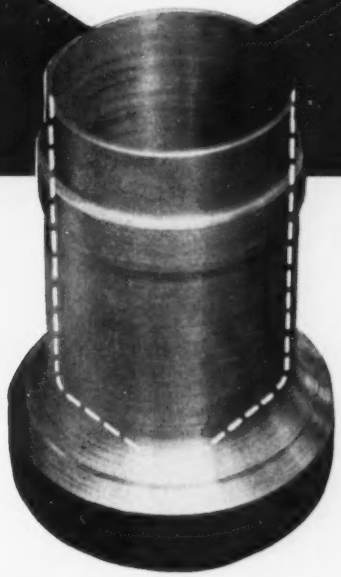
(For more information on products advertised, use Inquiry Card page 245)

THIS **63-lb.** 4150 STEEL BLANK

reduced to

THIS **18-lb.** SEMI-FINISHED COLLET





...in 13 minutes

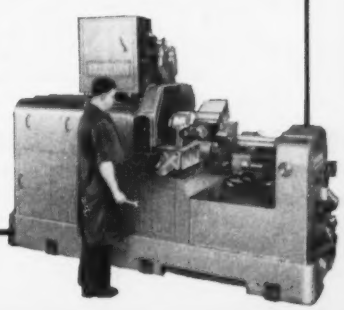
ON THE NEW **12" MC-UNIVERSAL**

ACME-GRIDLEY

Single Spindle Automatic Chucker

FEATURES

- **Six spindle speeds and three feed ranges, *all automatically selective* for each combination of change gears. Spindle speeds range from 25 to 1478 RPM.**
- **Five end working tool slides and two side slides each independently cammed. Turret indexing located in rugged outer turret support and driven by separate motor independent of cross slide operation.**
- **Open type tooling zone, large chip area, minimum change of cams. Interchangeable spindle speed and feed change gears—all contribute to quick change-over from job to job.**
- **Work cycle automatically controlled—no time loss between loading and unloading work piece.**
- **Strength to sustain close tolerance at the fastest feeds and highest speeds modern carbide cutting tools and hardened steel cams can take.**
- **Compact, accessible and free from complications — one man runs 2 or more machines.**



The floor to floor time on this particular job is 5 *times faster* than the previous method employed.

The job is typical. If savings like this—in man hours—in floor space, overhead—*total costs per job*—are important in your chucking work, why not ask us to help you make similar comparisons—get the facts.

Complete catalog, MC-53

You can't do TODAY'S job with YESTERDAY'S tools—and be in business TOMORROW.

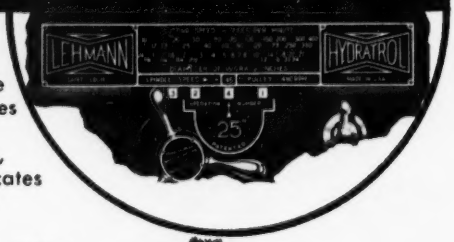
The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle —Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing



Just a "Twist of the Wrist" does it! ... The Lehmann HYDRATROL LATHE gives 16 Spindle Speed changes with Automatic Slide Rule Selection.



Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The rotary handle provides all speed changes for 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.



Check These Other Important Advantages:

- Safe in operation.
- Simplicity in construction and operation.
- Hydraulic friction clutches and hydraulic brakes, self-compensating.
- Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.
- Spindle release for chucking.
- Perfect, safety-control lubrication with filtered oil.
- Gears constantly in mesh.

Write today for additional information or catalog — or — send prints for time-and-money-saving recommendation!

LEHMANN MACHINE COMPANY
GRAND AT CHOUTEAU • ST. LOUIS 3, MO.
DIVISION OF NOVO ENGINE CO.

(For more information on products advertised, use Inquiry Card page 245)

Are you wasting dollars on over-finishing? Here is the problem and a suggested solution from Brush Electronics Company...

How surface finish control can help you reduce your machining costs

By F. W. Witzke, Application Engineer, Brush Electronics Company, Cleveland, Ohio

PROPER surface finish control may well give you big savings in your plant by reducing production costs, increasing production rates and improving product performance.

Directly or indirectly, the factor of surface roughness affects almost every physical, mechanical and economic consideration of a machined part.

Overfinishing is costly

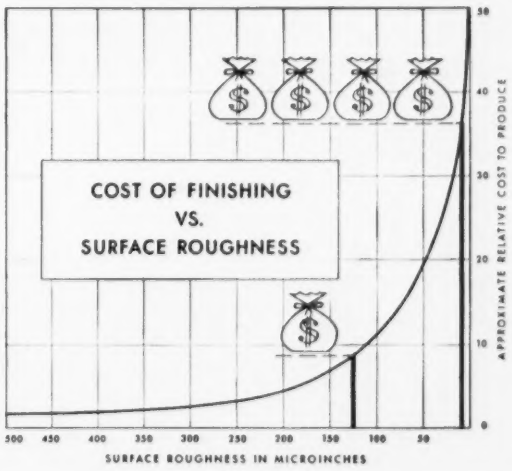
The chart at the right shows how finishing affects the cost of machined parts. For example, if the surface finish is specified as 125 microinches and you are overfinishing to 8 microinches because of lack of proper gaging equipment, your finishing costs can be four times as much as necessary.

To eliminate this costly overfinishing, actual checks of machined surfaces should be made in the shop to be sure that specified values are not exceeded. On mass production items, a reduction of a few cents per piece in machining may save thousands of dollars per year!

Surface finish control conserves machine capacity

By eliminating unnecessary operations you effectively increase plant capacity without additional investment. In this way surface finish control helps you increase production rates.

Periodic measurements of machined parts being processed also provide an excellent indication of when cutting tools should be replaced or dressed, because surface roughness increases rapidly with tool wear. Since many factors such as the tool, material, cutting speed, feed, etc., all affect the finish, proper information about finish helps you operate at optimum conditions, and higher speeds.



Improves product performance

Proper surface finish control affects more than production cost. It can influence many factors in product performance, such as:

Break-in Time	**Bearing Load**	**Adhesion**
Wear	**Reliability**	**Reflectivity**
Noise	**Heat Transfer**	**Leakage**
Appearance	**Friction**	**Galling**
Corrosion	**Lubrication**	**Safety**
Dimensional Tolerance		**Fluid Flow Resistance**
Fatigue Strength		**Tensile Strength**

Fortunately, there is now a simple method of measuring surface roughness on the production line so that these important advantages can be realized.

Continued on next page

(Advertisement)



Brush Surfindicator*

...a practical shop tool for measuring surface roughness

The SURFINDICATOR meets the need for a shop instrument to measure surface roughness in production and inspection. This instrument, developed by General Motors Research Laboratories Division, and manufactured under patent license from General Motors Corporation, offers you the key to reduced machining costs, more efficient use of equipment, and improved products.

With this new, portable inspection tool you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected, and then reads surface roughness in average microinches on the meter. This permits you to specify surface roughness in the design and then to measure it in the shop.

Using SURFINDICATORS, several plants in different locations can produce parts to the same surface roughness specifications. Here is the instrument that makes surface roughness measurement a practical shop operation.

Have you tried the SURFINDICATOR?

Visit us at Booth 1220 at the Metal Show and operate the SURFINDICATOR yourself. Or call your nearest Brush Electronics Representative for a demonstration.

EASY-TO-USE... After brief instruction, shop personnel can make accurate measurements with the SURFINDICATOR.



PORTABLE... Weighs only 15 pounds and can be set up anywhere in the plant where 115 volts a.c. is available. Completely self-contained.



ACCURATE... Precision Reference Specimens permit calibration to an absolute standard, and enable you to check accuracy of instrument at any time.

Price of the SURFINDICATOR is only $685, f. o. b., Cleveland. It is completely self-contained, is ready to put to work. **Trade Mark*

BRUSH ELECTRONICS COMPANY, DEPT. Y-10
3405 Perkins Avenue, Cleveland 14, Ohio

BRUSH ELECTRONICS

☐ Please enter our order herewith for ..... Model BL-110 SURFINDICATORS, at $685.00 each, f.o.b., Cleveland.

☐ Please send booklet on the advantages of surface finish control.

Name _____

Company _____ Your position _____

Address _____

City _____ State _____

Here's why The A. O. Smith Corp. uses Summerill STEEL PRESSURE TUBING



The A. O. Smith Corporation has found that Summerill Steel Pressure Tubing consistently meets their high quality tubing standards. For Summerill Seamless Tubing withstands internal pressures that would cause other tubing materials to quickly fail. It flares easily, and takes sharp bends in stride without flattening or developing an "orange peel" effect on the bend.

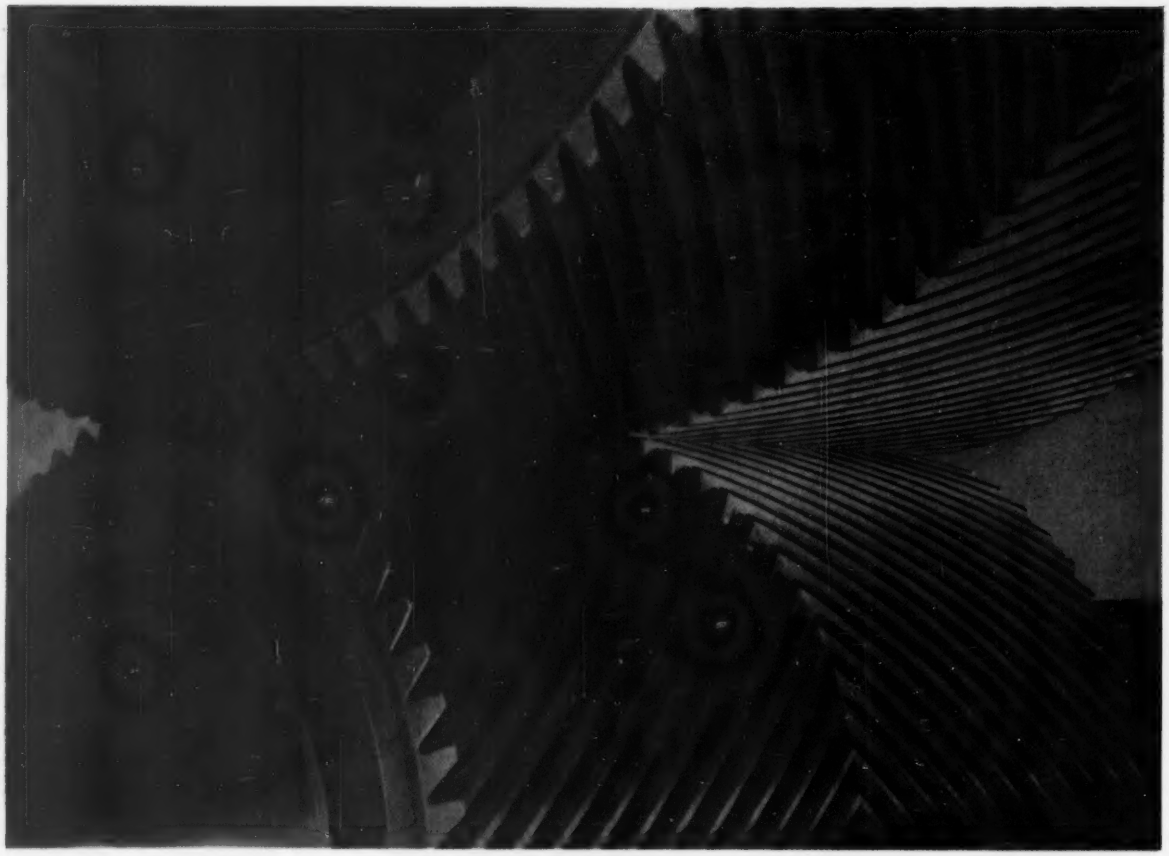
Summerill Pressure Tubing is Quality-Controlled from raw materials to finished product in one of the nation's most modern tubing plants. Only prime raw materials are used. As a result, you can depend on Summerill for top uniform quality of product—regardless of whether you buy a single length or by the carload. *And remember this:* Not one Summerill customer has ever received a "leaker," or reported a pressure tubing failure! Summerill Pressure Tubing is available in lengths up to 38 feet. ● For further details or technical assistance, call or write: *Summerill Tubing Company Division, Columbia Steel & Shafting Company, Pittsburgh 30, Penna.*

W&D 4600



IN COLD DRAWN SEAMLESS STEEL TUBING

SPECIFY Summerill AND BE SURE!



These gears INHERIT precision

The precision in Farrel® herringbone gears is passed on from the machine on which the gears are made — the Farrel-Sykes Gear Generator.

The accuracy inherent in the operating principle of the machine—"*precision generation*"—gives the gears extremely accurate tooth spacing, profile and helix angle. Because of this, you can be sure that Farrel herringbone gears will operate smoothly, quietly and efficiently over a long service life.

These precision-generated gears are made in any size from ¼" to 20' 0" diameter, for any power capacity and speed. Also available are straight tooth and single helical gears in sizes up to 20 feet diameter, and large internal gears with either spur or helical teeth.

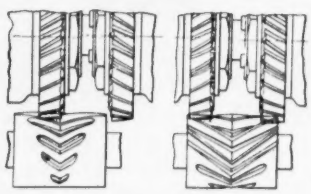
Farrel engineers will be glad to assist you in working out unusual gear problems. Write for further information about any of the types of high-precision gears mentioned above.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

Farrel-Birmingham®

FB-863



PRECISION GENERATION

The Farrel-Sykes gear generator is a gear-shaping machine having two cutters, mounted on a single reciprocating carriage, with their cutting faces opposed.

The cutters reciprocate, one cutting when movement is in one direction and the other when the movement is reversed. Each ends its stroke at the center of the blank. As they cut they twist to generate the helices and also slowly revolve in unison with the gear blank to generate the tooth contours precisely.

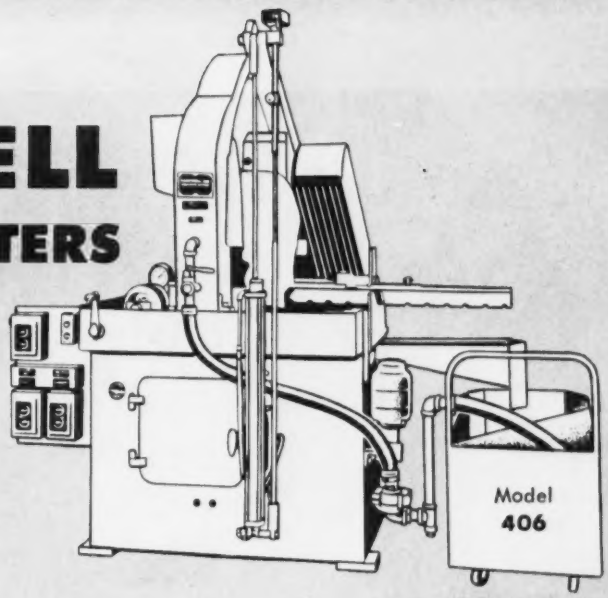
(For more information on products advertised, use Inquiry Card page 245)

ACCO products

See These Machines–

CAMPBELL
ABRASIVE CUTTERS

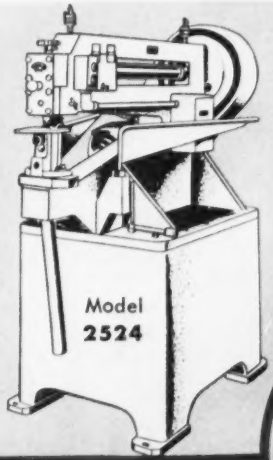
For fast, clean, accurate cutting of hard, soft, round, hex, square, or shaped stock



... at the
National Metal Exposition
CLEVELAND
OCTOBER 19 TO 23 • BOOTH 1716
See the Campbell Cut-Off Machines and Nibblers in action!

CAMPBELL
NIBBLERS

Cut odd shapes from ferrous or non-ferrous shapes



ACCO

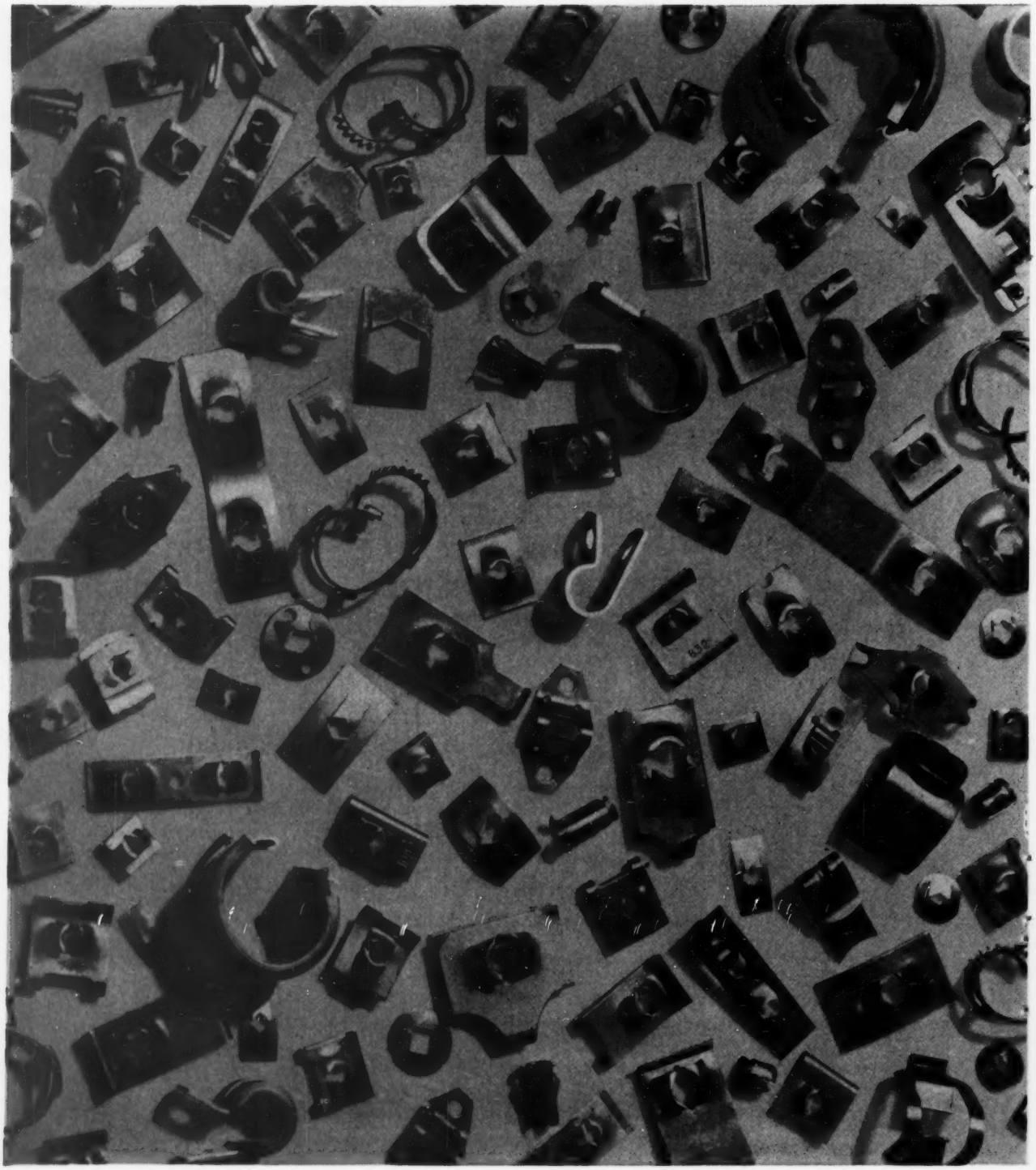
TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

925 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters and Nibblers

how Tinnerman Products solved

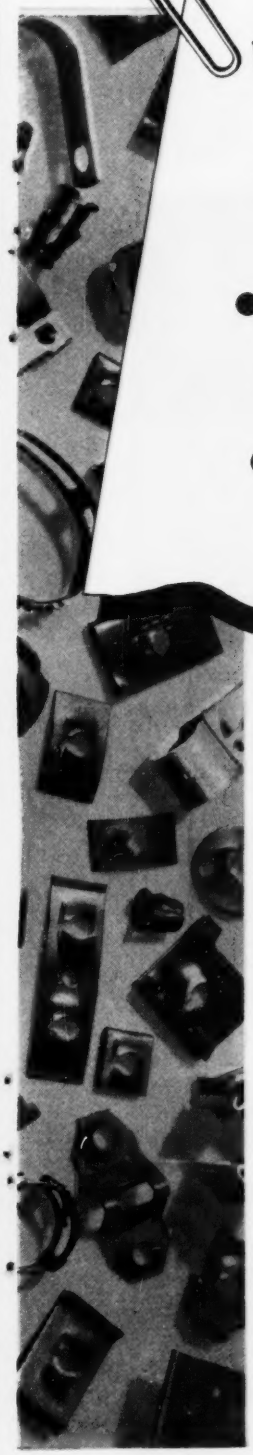


a tough heat-treating problem:

with Gulf Super-Quench

- minimum hardness was increased from 50 to 60 RC
- variation in hardness was reduced from ±5 to ±2 RC

on AISI C-1064 STEEL



Tinnerman Products, Inc., Cleveland, Ohio, manufactures a large variety of spring clips and spring fasteners of the type pictured at the left. These parts range in thickness from .01 to .062 inches and are all made of AISI C-1064 spring steel.

Normal heat treating practice calls for heating to 1600 deg. F. in a controlled atmosphere. The parts are held at this temperature for approximately ½ minute, then are transferred by a shaker-type conveyor into the quenching bath, which is held at 120 to 125 deg. F. After quenching, the parts are tempered at 700 deg. F.

When Tinnerman used a conventional quenching oil, hardness varied from 50 to 60 RC—too low and too variable for suitable performance characteristics. Examination of the steel revealed that in all cases it was within specification limits.

After investigating a number of other quenching oils, Tinnerman Products discovered one that is outstanding—Gulf Super-Quench. Tinnerman Products is now quenching all of these parts in Super-Quench with remarkable results. Hardness is never lower than 60 RC and averages 62 ± 2. This improvement was obtained without any change in quenching temperature, degree of agitation, analysis, or grain size.

If you, too, are looking for ways and means to increase the efficiency of your quenching operation, it will pay you to investigate the advantages of Gulf Super-Quench. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

Pittsburgh 30, Pennsylvania

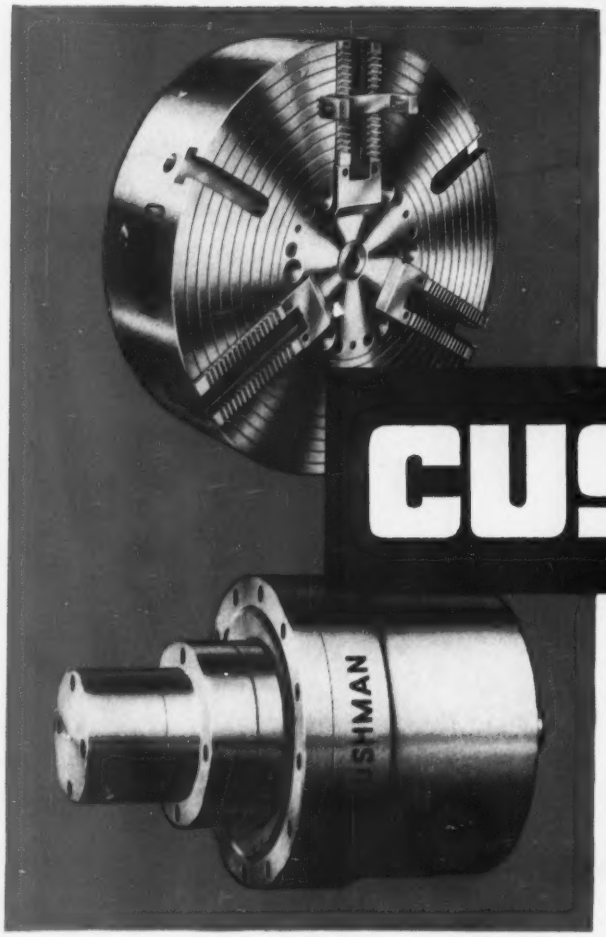
GULF SERVES INDUSTRY

(For more information on products advertised, use Inquiry Card page 245)



CONSERVE YOUR MAN-POWER

YOU CAN'T MACHINE IT ECONOMICALLY UNLESS YOU HOLD IT RIGHT



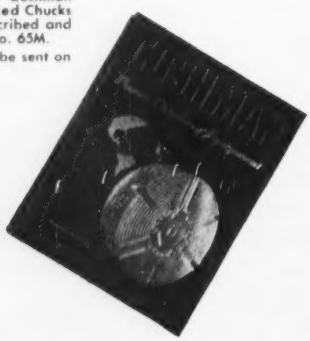
CUSHMAN

AIR CHUCK EQUIPMENT

There is a correct type of standard or special chuck and jaw equipment for every chucking job. Cushman's background of experience in this specialized field can usually help you find it and thus save time and money, while frequently simplifying set-up methods.

This is especially true in the comparatively new field of AIR CHUCKING. Cushman's very complete line of Precision Air-Operated Chucks, High Speed Air Cylinders and Accessories, and the Cushman Power Wrench, offers almost unlimited possibilities in tooling for economy and speed without sacrifice of quality. Our engineers will welcome your problems.

The Cushman Power Chuck Catalog No. PO-64M covers our complete line of Air Chucks, Air Cylinders, and Accessories . . . . Cushman Manually-Operated Chucks are separately described and listed in Catalog No. 65M. Either or both will be sent on request.



THE CUSHMAN CHUCK COMPANY
HARTFORD 2, CONNECTICUT, U. S. A.
Chucking Engineers Since 1862

Manufacturers of

AIR CHUCKS, CYLINDERS, and ACCESSORY EQUIPMENT • THE CUSHMAN POWER WRENCH • CUSHMAN MANUALLY-OPERATED CHUCKS and FACE PLATE JAWS.

10CS52R

A WORLD STANDARD FOR PRECISION

(For more information on products advertised, use Inquiry Card page 245)

half the time with Heller NUCUT

wavy teeth Coarse, fine and extra-fine teeth all combined on one file for fast, deep, double-action cutting. Even, scratch-free finish. No chattering. Longer file life. **ORDER FROM YOUR LOCAL DISTRIBUTOR**



American-Swiss
VIXEN NUCUT

THESE THREE FAMOUS FILES ARE MADE ONLY BY HELLER BROTHERS

HELLER BROTHERS COMPANY

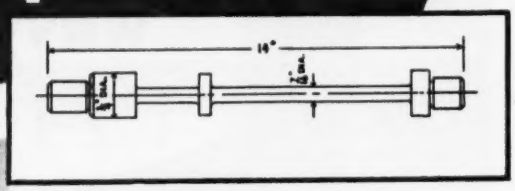
America's Oldest File Manufacturer

NEWCOMERSTOWN, OHIO

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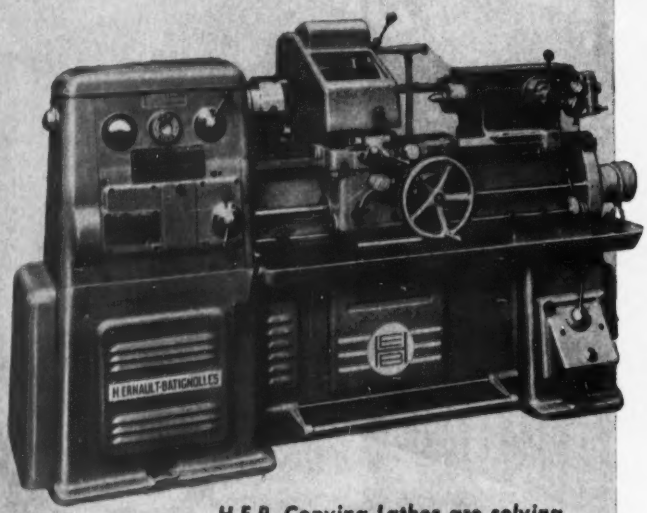
Got a tough turning problem?



HIGH SPEED HYDRAULIC Copying Lathes

will show you how easy it can be!

- **Slash production time**
- **Produce better finish and closer tolerances**



H.E.B. Copying Lathes are solving turning problems in these plants:

- Acromatic Tool Company
- Beaver Precision Products, Inc.
- Buick Division, General Motors Corp.
- De Laval Separator Co.
- East Coast Aeronautics, Inc.
- Electrol, Inc.
- Fox River Ordnance Plant
- Harvey Machine Tool Company
- Manufacturers Tool & Gauge Co.

. . . AND MANY OTHERS!

We'd like to make your troublesome jobs easy. *SEND US A PRINT OF YOUR MOST DIFFICULT TURNING JOB* for analysis by our engineering staff! We think we can prove to you that the H.E.B. is *"The* Way to Turn!" There's no charge or obligation, of course.

That spindle you see in the drawing has actually been copy-turned on the H.E.B. in just 2.1 minutes floor-to-floor time, machined from SAE 1040 . . . and every copy-turned part is identical.

The new H.E.B. fully automatic copying lathes with motors up to 60 H.P. are the most economical way to turn high production bar and chucking jobs. The OP Models offer fast machining even when lots are as few as half a dozen pieces. GT Models copy-turn molds and irregular work.

Ask for a demonstration now or for detailed literature—Study our insert in Sweet's Machine Tool catalog!

IMMEDIATE DELIVERY

H·E·B

"THE WAY TO TURN"

H.E.B. MACHINE TOOLS, INC.

475 FIFTH AVENUE • NEW YORK 17, N. Y.

LExington 2-0266

Certain exclusive sales territories are still open.

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

(For more information on products advertised, use Inquiry Card page 245)

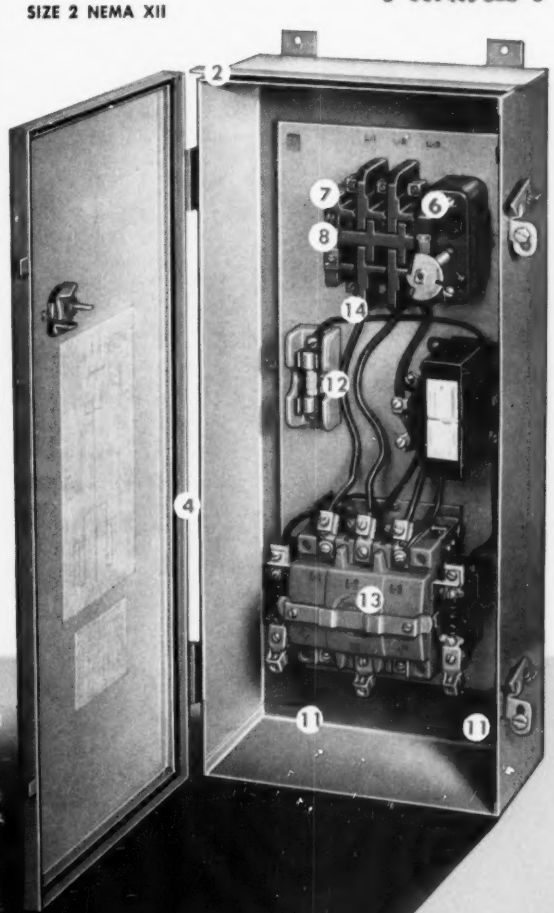
INDUSTRY ASKED for it...HELPED US DEVELOP it...

AND Here it is!

THE NEW TYPE "RAC" ARROW AH HART COMBINATION STARTER

NEMA TYPES I, IA and XII

SIZE 2 NEMA XII



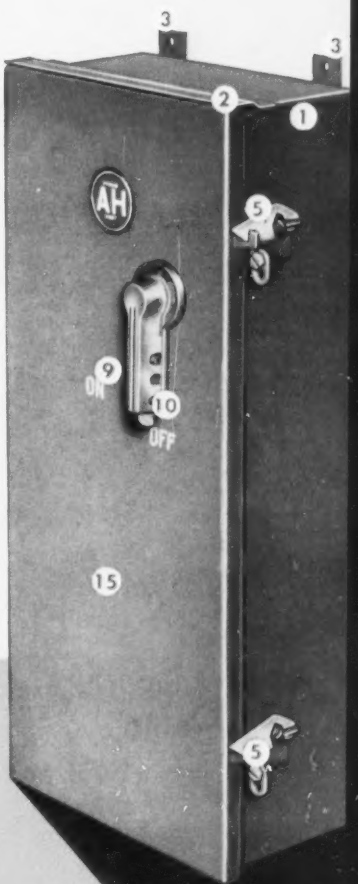
Features:

FOR NEMA XII

1. **HEAVY, SEAM WELDED CONSTRUCTION** . . . with no knockouts.
2. **OIL DRIP SHIELD** . . . prevents collected oil from dropping on starter when door is opened.
3. **EXTERNAL MOUNTING BRACKETS** . . . let oil drain down behind enclosure.
4. **OIL PROOF NEOPRENE GASKET** . . . retained by both cement and channel.
5. **AUTOMATIC LATCHES** . . . hold door securely even if locking screws are accidentally left loose.

FOR ALL-NEW DISCONNECT

6. **HEAVY SILVER CONTACTS** . . . for long life.
7. **CONTACTS COMPLETELY VISIBLE** . . . maintenance man can SEE that the Disconnect is off.
8. **CONTACT CARRIER INSTANTLY REMOVED** . . . for inspection or replacement.
9. **SIMPLE, SAFE, STURDY MECHANISM** . . . **COVER CAN'T BE OPENED WITH DISCONNECT ON** . . . handle must be turned to "Open" with Disconnect "Off".
10. **HANDLE PROVIDES FOR 3 LOCKS** . . . can only be locked in the "Off" position.



GENERAL

11. **ENTIRE COMBINATION REMOVABLE** . . . from box by merely loosening two non-removable screws.
12. **TRANSFORMER FUSED ON SECONDARY SIDE.**
13. **TYPE "RA" STARTER** . . . with exclusive "Right Angle" Operating Mechanism.
14. **ALL CONTROL WIRING *RED*** . . . **ALL LINE WIRING BLACK.**
15. **SMALLER SIZE** . . . Size 1 unfused . . . entire unit is just 15⅜" x 7½" x 4¾".

ENGINEERED FOR SAFETY

NEMA TYPE XII built to JIC STANDARDS

TURN THE PAGE FOR ADDITIONAL INFORMATION



ENTIRELY NEW
OUTSTANDINGLY ADVANCED
EXACTLY RIGHT FOR INDUSTRY'S NEEDS

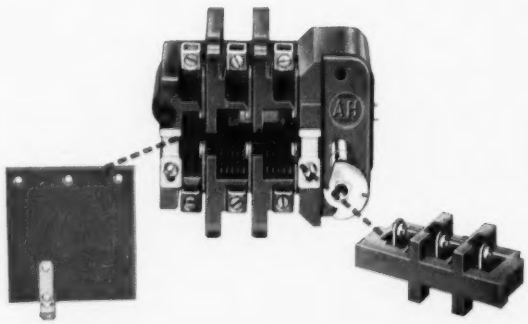
ARROW AH HART

TYPE "RAC" COMBINATION STARTER

Leading Machinery Engineers throughout industry worked with us to develop this all-new, "RAC" Across-the-Line Combination Starter. The NEMA Type XII is designed, engineered and constructed to meet all JIC Standards for Safety, Oil Tightness and Convenience in both operation and maintenance. In addition, the Type "RAC" offers smaller size plus new standards of electrical performance and dependability . . . possible only with the exclusive Arrow-Hart "RA" Starter Design.

Incorporating EXCLUSIVE "RA" DESIGN with All-New "RAD" DISCONNECT

The "RAD" Type Disconnect is a completely new, front operated design that offers many important advantages for both safety and convenience. The operating mechanism is simple and rugged with a safe "Off" position. The enclosure door of the "RAC" cannot be opened unless the operating handle is moved to the "Open" position and the Disconnect is off. The handle has provision for three padlocks and can be locked only in the "Off" position. The butt-to-butt type contacts of heavy silver are provided with a clip-on cover that may be used or not as desired. When this cover is removed, the contacts are completely visible for easy inspection . . . and to give the maintenance man an additional *visual* assurance that the Disconnect is off. The Contact Carrier . . . held in place by two swinging latches . . . can quickly and simply be removed entirely for fast, easy inspection, maintenance or replacement.



Available

- With GENERAL PURPOSE (NEMA TYPE I) ENCLOSURE
- With SEMI-DUST (NEMA TYPE IA) ENCLOSURE
- With OILTIGHT (NEMA TYPE XII) ENCLOSURE
- With DISCONNECT . . . Fused or Unfused Type
- With CIRCUIT BREAKER TYPE DISCONNECT
- REVERSING and TWO SPEED TYPES
- In NEMA SIZES 0, 1 and 2 . . . with Sizes 3 and 4 coming soon
- With or without CONTROL CIRCUIT TRANSFORMER

SEND NOW FOR COMPLETE INFORMATION ON THE TYPE "RAC" COMBINATION STARTER

AH

Industrial Control Division
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 Hawthorn Street, Hartford 6, Conn.

Please send me complete product literature covering:
☐ *Type "RAC" Combination Starters* ☐ *"RA" Motor Control Design Story*

NAME_____
POSITION _____
COMPANY_____
CO. ADDRESS_____
CITY_____ ZONE_____ STATE_____

ARROW-HART
INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD 6, CONNECTICUT

OFFICES, SALES ENGINEERS AND WAREHOUSES IN: ATLANTA, BOSTON, BUFFALO, CHARLOTTE, CHICAGO, CINCINNATI, CLEVELAND, DALLAS, DETROIT, HOUSTON, INDIANAPOLIS, KANSAS CITY MO., LOS ANGELES, MILWAUKEE, MINNEAPOLIS, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, SAN FRANCISCO, SYRACUSE. Sales Engineers in Columbus O., York, Pa., Fayetteville New York, Manchester Ct., Seattle, Springfield Mass. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO.

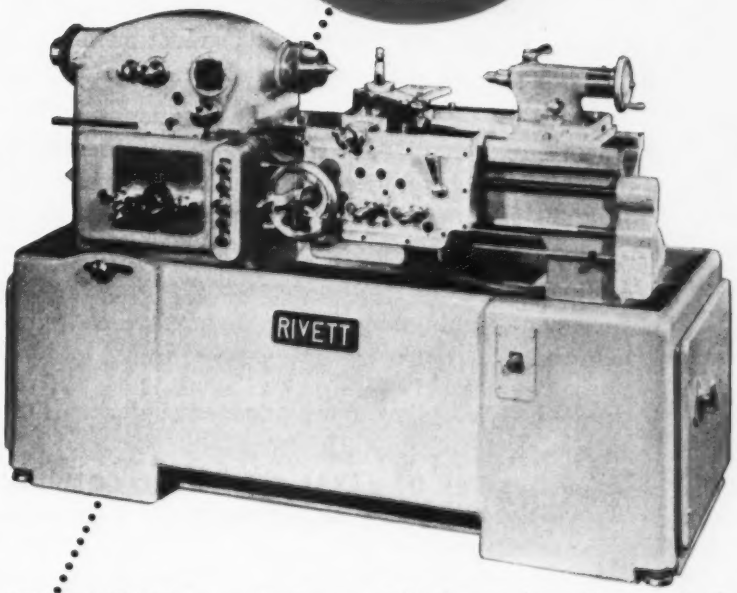
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2 FOR 1

RIVETT 1020S

HAS WHAT IT TAKES TO MAKE AN OUTSTANDING LATHE

★ 40% heavier than comparable lathes. Weighs 3900 lbs. ★ Back gearing for power cuts—belt drive free of all gearing for high speeds. Range from 22 to 3600 R.P.M. ★ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ★ Infinite spindle speeds through trouble-free mechanical drive. ★ Push button controls for complete operation. ★ Neutral clutch stops spindle without stopping drive. ★ Three bearing mounts for spindle. ★ Collets mount directly in spindle. ★ Hand wheel for turning headstock spindle ★ Anti-friction bearings used throughout. ★ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ★ Automatic lubrication. ★ Hardened and ground feed screws.



RIVETT 1020S is an Instrument Lathe and an Engine Lathe

A double-duty machine—combining the feather-touch sensitivity of an instrument lathe with that heavy-biting ruggedness which carbide cutting tools require. This powerful geared-head lathe qualifies for any turning within its 12¼" swing and 20" centers.

Bulletin 1020A has proof of how outstanding this Rivett would be in your shop. Write for copy today.



RIVETT LATHE & GRINDER, Inc.

Dept. MR-10, Brighton 35, Boston, Massachusetts

You can use other lathes . . . or employ other types of metalworking machines . . . but on no other tool can you get so much production with such fine precision as on a Rivett.

(For more information on products advertised, use Inquiry Card page 245)

NO GETTING AROUND IT!



A De Laval Oil Purifier Safeguards Production and Salvages the Oil

Purification of cutting oil or other factory oils by De Laval Centrifugal Oil Purifiers is both a salvage and a maintenance operation. The value of being able to re-use purified oil instead of throwing used oil away is obvious. Even more important than the salvage value of the oil, however, are the actual production advantages of having a plentiful supply of oil maintained absolutely free of metallic impurities.

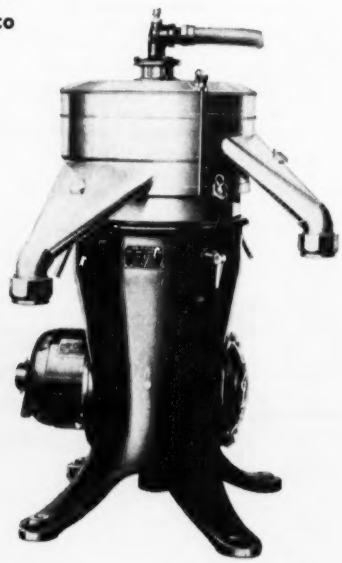
When the oil is cutting oil, the production advantages of De Laval purification include longer tool life—higher permissible cutting speeds—minimized wear on moving parts of machine tools. If the oil is test oil, the tests themselves are more reliable when the oil is kept dry and clean by centrifugal force.

These are only two of the many types of factory oils that yield both salvage and maintenance savings when purified by De Laval machines.

Bulletin MM-1 gives many other examples. Write for your copy.

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

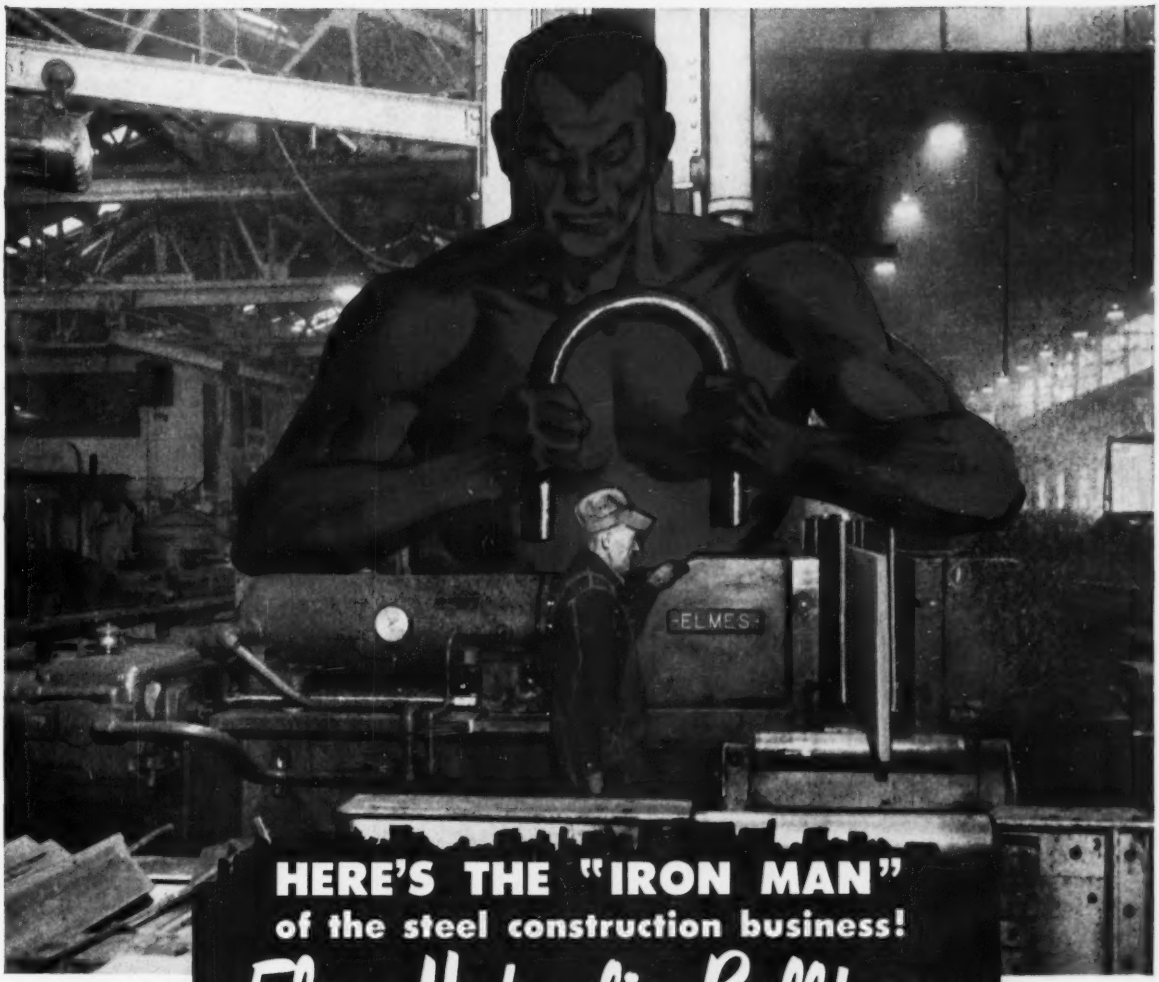
You save more than the oil when you purify with ....



De Laval

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

(For more information on products advertised, use Inquiry Card page 245)



HERE'S THE "IRON MAN" of the steel construction business!

Elmes Hydraulic Bulldozer

Shown in operation is a 200-Ton Elmes Hydraulic Bulldozer, working in the shop of one of the country's larger steel construction companies. This customer reports his Elmes Bulldozer *"has been busy without interruption since it was installed . . . has performed a tremendous amount of bending and straightening work . . . turned out a greater number of pieces than ever anticipated."*

There are sound reasons why Elmes Hydraulic Bulldozers receive such enthusiastic recommendations. They're built rugged for rugged work — heavy bending, forming, straightening. Bed and frame are of simplified, solid design, using bolted and keyed construction of structural steel. And the design is *clean*. Top of the press is clear—free from obstructions. Pumping unit is located low, at the end of the press. The press is protected. You can bring work to the press—position it quickly, from an overhead traveling crane. Head is adjustable for varying the work space opening.

Elmes Hydraulic Bulldozers are available in capacities up to 500 tons, with bed size, stroke and speed optional to suit your requirements. Your Elmes distributor can give you full details on these versatile presses and on the complete line of Elmes Hydraulic Metal-Working Presses. See him now—or write us for Bulletin No. 1010 B.

American Steel Foundries

ELMES ENGINEERING DIVISION

1162 TENNESSEE AVENUE CINCINNATI 29, OHIO

DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS — ALSO MANUFACTURED IN CANADA

METAL WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

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SPRINGFIELD



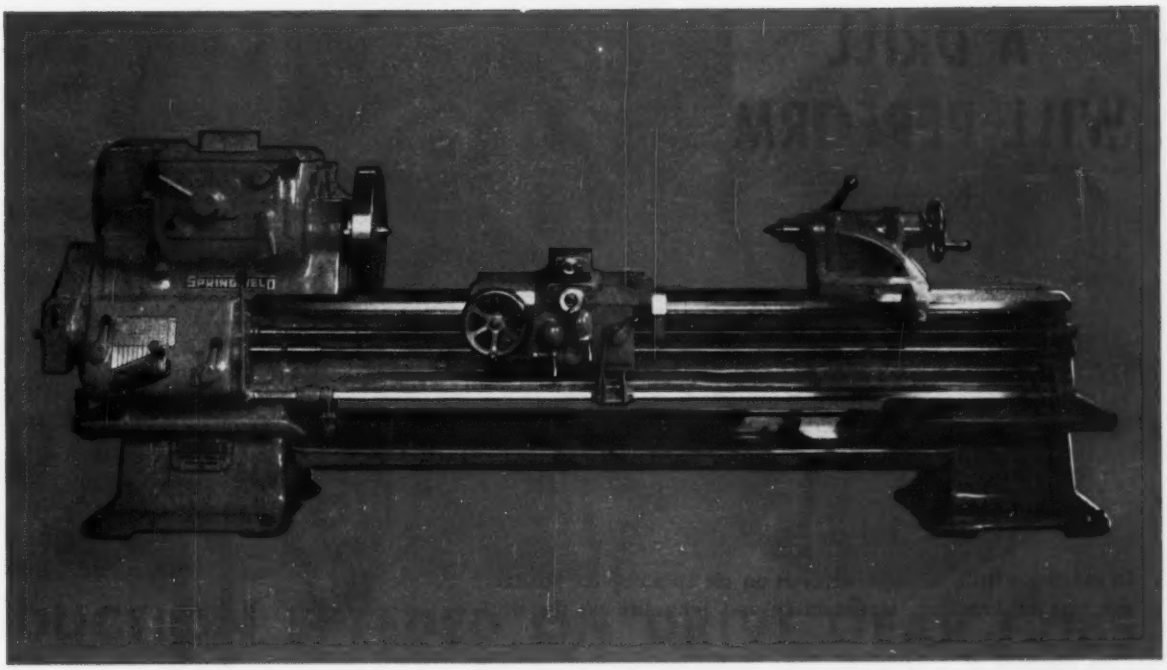




At TRACTOMOTIVE Corporation

Tractomotive Corporation, Deerfield, Illinois, manufacturers of the widely known line of TRACTOSHOVELS and TRACTOLOADERS use several Springfield Lathes on heavy operations. Tractomotive's management says: "Production records, low maintenance costs and operator preference have shown us that Springfield Lathes fit our manufacturing picture perfectly."

LATHES



What are YOUR Lathe Production Problems?

TURNING—BORING—CONTOURING—PROFILING?

Springfield has a long record of successful pioneering in the adaptation of Springfield Lathes to production of all types of work. Extreme versatility is a characteristic of Springfield Lathes and Accessories. Your production can be improved by installing a Springfield Lathe equipped with proper attachments.

Information is available to you through an experienced Springfield Distributor in your area. We will gladly arrange for a sales engineer to survey your production problems.

Write, wire or phone:

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

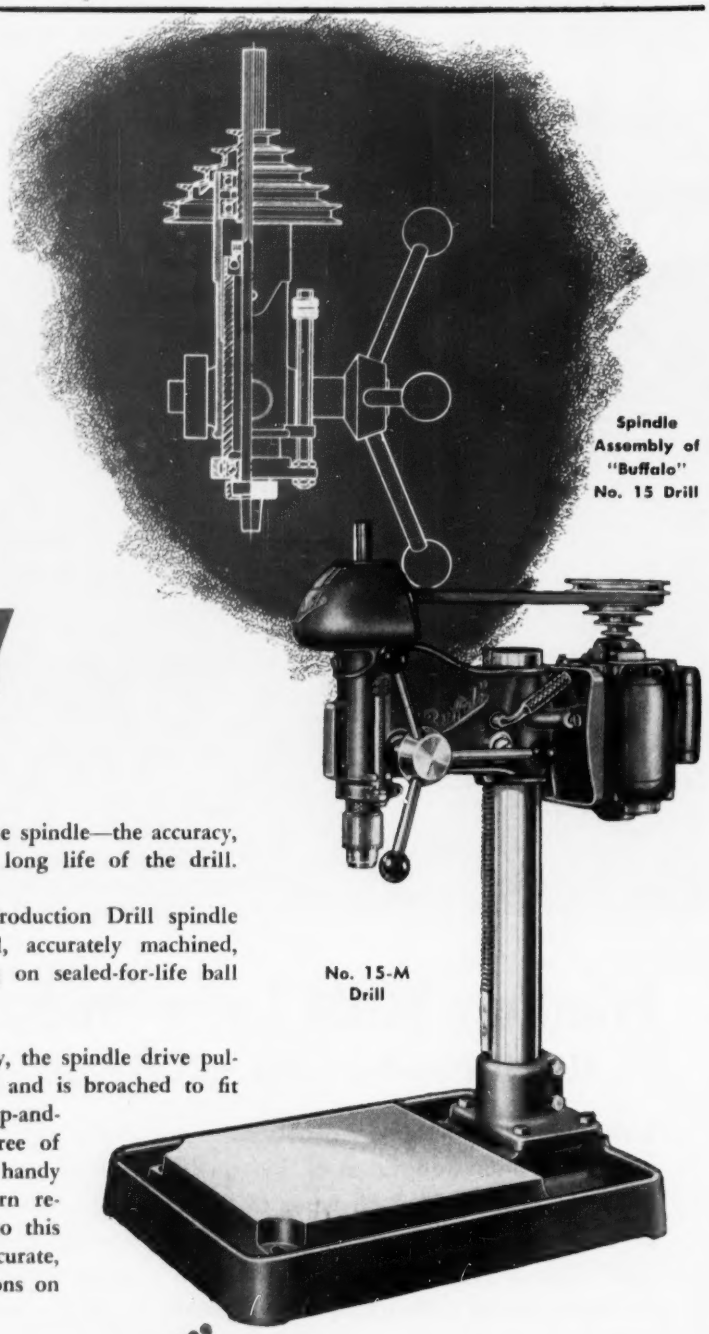
EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

(For more information on products advertised, use Inquiry Card page 245)

"Buffalo"

Tips on Better DRILLING

JUDGE HOW A DRILL WILL PERFORM by its SPINDLE ASSEMBLY



Spindle Assembly of "Buffalo" No. 15 Drill

No. 15-M Drill

In judging a drill, so much depends on the spindle—the accuracy, the ease of handling, serviceability and long life of the drill.

This diagram of a "Buffalo" No. 15 Production Drill spindle shows why. The spindle is alloy steel, accurately machined, ground, and polished—smoothly turning on sealed-for-life ball bearings and free of end play.

For further ease of handling and accuracy, the spindle drive pulley runs on two precision ball bearings, and is broached to fit the 6 spindle splines so accurately that up-and-down sliding action of the spindle is free of play, yet practically frictionless. The handy 3-spoke feed and adjustable spring return reduce operator fatigue. Why not look into this line of drills built essentially for easy, accurate, low cost work? Write for recommendations on *your* drilling problem!

"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

440 BROADWAY BUFFALO, NEW YORK

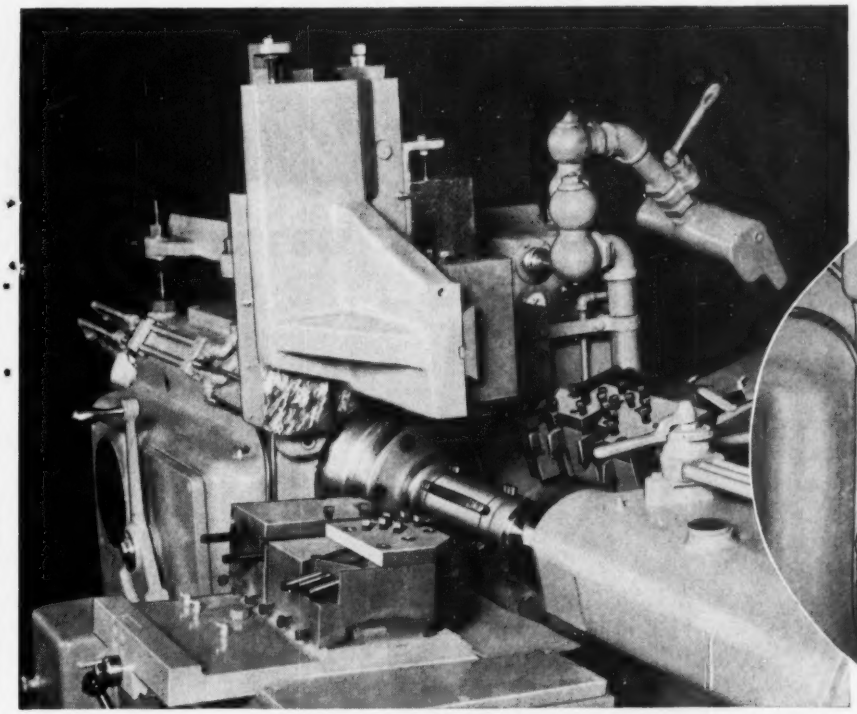
Canadian Blower & Forge Co, Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

(For more information on products advertised, use Inquiry Card page 245)

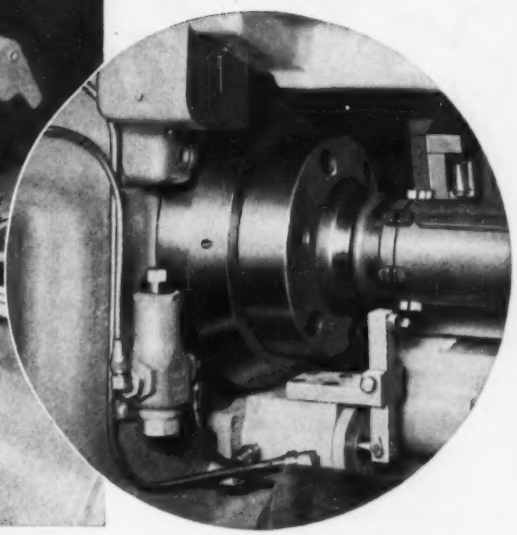
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK

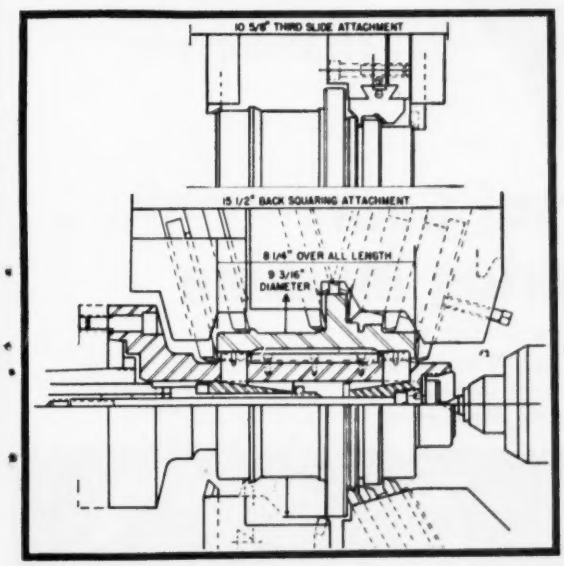


Close-up view of machine showing details of Driving Arbor

Close-up view showing Air-operated Locator



PRODUCTION SPEEDED ON DRIVE GEAR HUBS WITH MODEL "AR" AUTOMATIC Lo-swing LATHE



Problem: **To automatically turn, face and chamfer shoulders, and cut groove on Gear Hub with 9" Flange diameter, locating and centering from bottom of spline previously machined.**

Solution: **The Model "AR" Automatic Lo-swing Lathe was selected for this job due to its rigid construction and its demonstrated fine performance with cemented carbide tools.**

The expanding, air-operated driver, shown in the line drawing and the main illustration, is fitted with two sets of six driving jaws which accurately center the part true with the bottom of the splines. The jaws are actuated with two independently-expanding bushings and pull bars which equalize the pressure on both sets of jaws. The parts are located longitudinally on the arbor by an automatic, air-operated locator, which moves forward to the exact locating position when the tailstock spindle is withdrawn and relieves when the spindle is advanced.

All diameters are turned with the tooling mounted on the front carriage slide. The squaring, chamfering and grooving operations are divided between the rear and vertical slides in order to simplify the tooling which is used for several different sizes of hubs. The line drawing shows the tooling in detail.

Consult our Engineering Department for Automatic Lo-swing Lathes engineered for your particular turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

The NEW

MODERN universal Burr-Master*



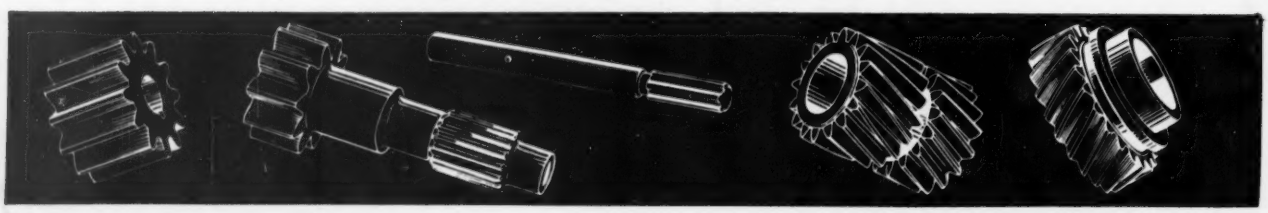
Model BME-14 Universal Burr-Master burrs and chamfers the complete tooth form on both sides and root as shown below.



The First Truly Universal Gear Burring and Chamfering Machine

At last, you can burr and chamfer the entire tooth form of both spur and helical gears from ⅝ to 9½-inches pitch diameter, as well as external straight and involute form splines on the new Universal Burr-Master by Modern.

* Patents Pending



The new BME Universal Model Burr-Masters will solve your gear and spline deburring and chamfering problems at production rates heretofore impossible. Truly the answer to a normally costly gear and spline production operation, Modern's new Universal Burr-Master is . . .

universal . . because it doesn't sacrifice speed for versatility. Operating continuously, the machine deburrs and chamfers more than five teeth per second. A typical 22-tooth gear can be completely finished at a rate of more than 600 per hour, at 80% efficiency.

universal . . because new models have a capacity range from 5/8 to 6 1/2-inches pitch diameter and 3 to 9 1/2-inches pitch diameter for popular pitch gears. Both single and two-station models are offered for additional versatility.

universal . . because an unskilled operator can change the precision tooling for a different part in about 10 minutes setup time.

universal . . because it automatically compensates for minor stock variations in production parts. This unique design feature lets you deburr and chamfer gears or splines that are slightly oversize or out-of-round without affecting the operating cycle.

universal . . because all controls and adjustments are readily accessible when needed. No special tools required in making adjustments or changeover. All models developed for maximum production with minimum downtime.

universal . . because precision form-cutting tools can be removed, sharpened and replaced by an unskilled operator without worry as to gaging or alignment to retain correctness of form. Long tool life, too.

For complete details, write today for Bulletin 103-60

14230 BIRWOOD AVE. **MODERN** DETROIT 4, MICHIGAN

Industrial Engineering Co.

(For more information on products advertised, use Inquiry Card page 245)



AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS

How to match motors and controls to production machine capacity

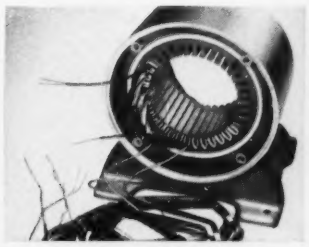
Figure the cost of down time for this gang drill press and you have another reason why thousands of users depend on the reliability of Life-Line* motors and controls. Compare these modern standards set by Westinghouse Motor and Control design:

Take Life-Line motors for example: heavy steel gives added strength yet lighter weight for increased torque per pound. Pre-lubricated bearings do away with greasing. Continuous wound stator coils are dipped and baked in special Tufvar® insulation varnish, for thorough protection against dirt and grease. In addition, the Life-Line motor is actually 33% smaller overall, than similar horsepower motors. It takes up less space on production machinery . . . can be located in cramped quarters.

*Trade Mark

For maximum service, Life-Line starter design reduces the number of moving parts. The overload relay operates with snap action by means of a special bimetallic disc developed by Westinghouse. The clapper-type contactor is seesaw balanced on a knife-edge bearing. This means there are no sliding members . . . nothing to stick or jam. Most important, the exclusive "De-ion®" arc quencher more than doubles the life of the contacts.

Your local Westinghouse representative will gladly give you a Life-Line 101 Case History booklet, B-4769-A. You can see these facts as they are presented in the movie *Life-Line Speaks for Itself.* Ask, too, for Westinghouse Control Booklets B-5882 and B-6051; or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21752



Continuous wound coil groups assure positive current flow through windings . . . reduce the number of connections between coils.



"De-ion" arc quencher confines, divides and extinguishes hot arcs in a half cycle or less; greatly increases contact life.



YOU CAN BE **SURE**...IF IT'S

Westinghouse

NOW SCULLY-JONES TURNS

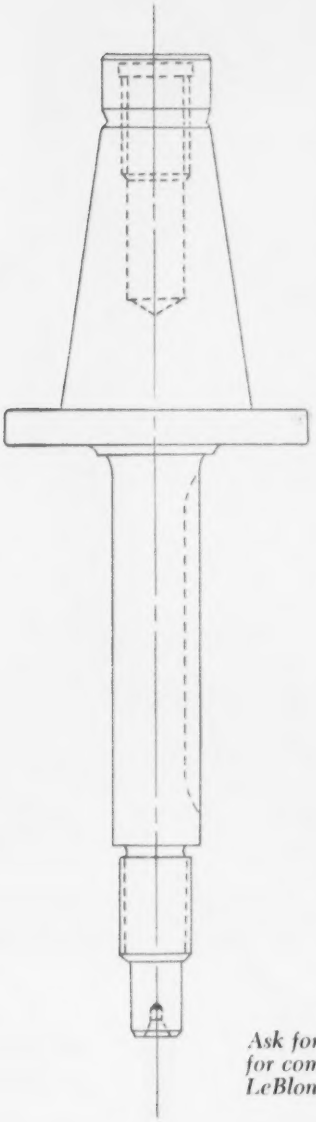
four arbors instead of 3...



Hydra-Trace (Trade Mark, Registered U. S. Pat. Off.) is LeBlond's heavy-duty hydraulic tracing attachment can be mounted in place of the compound rest on practically all LeBlond Lathes built since 1935

same time, same lathe...

plus "Hydra-trace"*



When defense needs mushroomed demand for production equipment, Scully-Jones & Co. of Chicago found itself jammed with orders for milling machine arbors (they make more arbors than anyone else). Acting on advice from engineers at LeBlond's Chicago Office, Scully-Jones added Hydra-Trace to their LeBlond 16" RT Engine Lathe. Now they turn out four arbors in the time formerly needed to produce three—same lathe, plus Hydra-Trace.

Besides boosting output, this template-controlled hydraulic tracer saves 45% on set-up time, gives uniform precision without the need of a highly-skilled operator.

Stepless form-turning, contour facing, and turning step shafts are all in a day's work for Hydra-Trace. *Fits all LeBlond Engine Lathes built since 1935,* can be mounted easily in a matter of minutes. Templates are flat, compact, suitable for both rough and finish turning. They can be produced readily in your own plant, stored in limited space.

When turning requirements call for increased output—with present machines or with new equipment—you'll find just what you need in LeBlond's complete line of lathes and lathe attachments.

Call your nearby LeBlond Distributor or write—

Ask for Bulletin HT2D for complete details on LeBlond Hydra-Trace.

turned faster by LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 65 YEARS*

(For more information on products advertised, use Inquiry Card page 245)



"Machining leaded steel at 238 SFM posed a tough problem!"...

One of the largest machine shops in the South, doing government ordnance work, was experiencing difficulty with tool burning, build-up and poor finish of product. Several major oil companies were finally called in for recommendations.

Horace Lane, a Sinclair Lubrication Engineer, studied the problem which involved machining leaded steel at 238 surface feet per minute!

Mr. Lane reports, "The solution depended on finding an oil light enough to carry off the heat, but with enough extreme pressure characteristics to withstand the heavy cutting, boring and threading – and still obtain an extremely high finish."

Mr. Lane continues, "Basing my recommendation on previous experience, I suggested Sinclair ORBITOL® Cutting Oil because of its high film strength and anti-weld properties. The company agreed to a trial run – *and* ORBITOL *turned the trick*. Not only was tool life lengthened, but production was substantially increased and product finish easily met required specifications."

Why not give a Sinclair Lubrication Engineer the chance to help solve your lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR LUBRICANTS

(For more information on products advertised, use Inquiry Card page 245)

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE



You don't waste productive space storing steel!

WHEN YOU BUY STEEL FROM WAREHOUSE, YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

You can turn your present steel storage space into profitable production space—without danger to the continuity of your steel supply. Just use a U. S. Steel Supply warehouse as your own. U. S. Steel Supply can deliver the steel you want to your plant or job site at whatever time you desire. Ask your U. S. Steel Supply salesman to arrange delivery of your steel at *your* convenience—and you'll find your steel arriving with timetable dependability.

U. S. STEEL SUPPLY

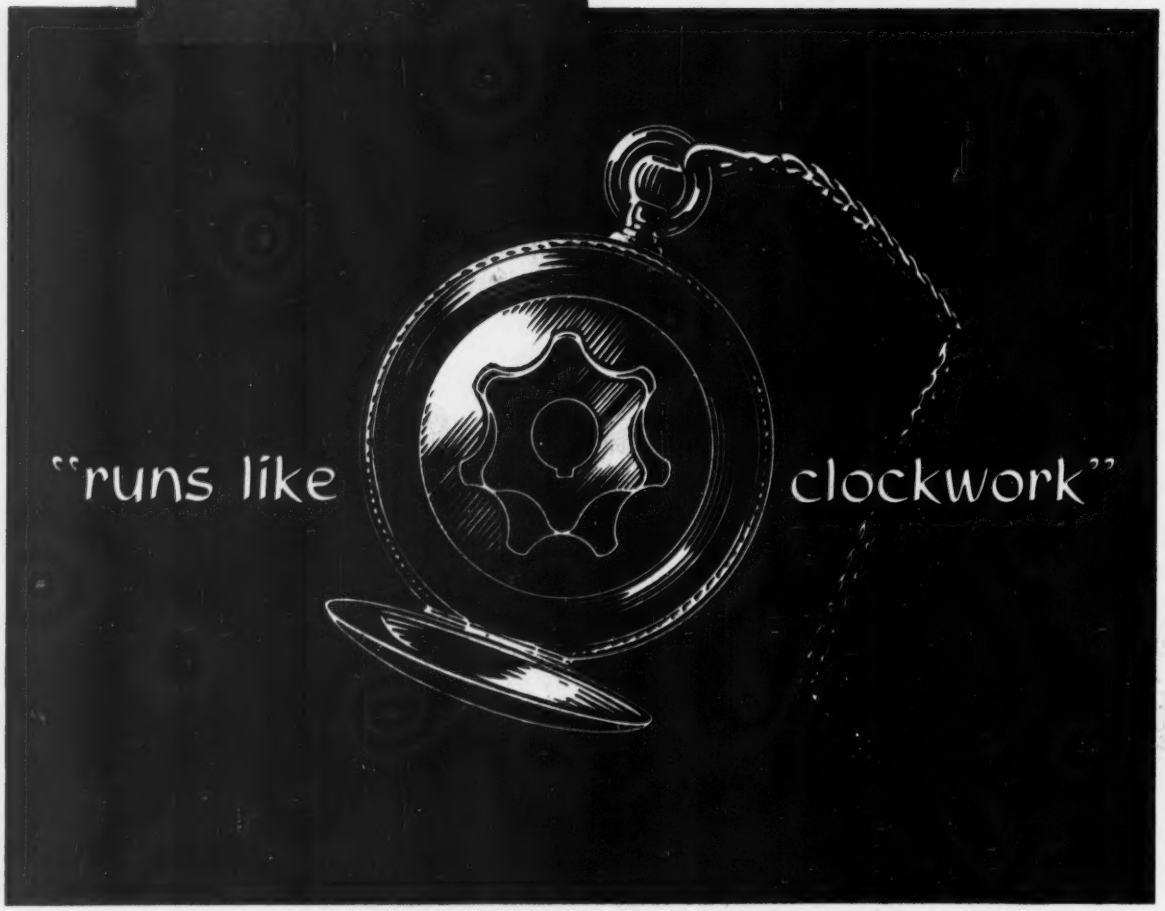
DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

the GEROTOR mechanism



because it's **PRECISION** engineered

In every GEROTOR pump or motor, precisely paired gear-shaped elements transmit power from or to the shaft with high efficiency. These elements, revolving in the same direction at low relative speed, constitute the GEROTOR mechanism . . . famed for longer life, less wear, less slippage, dependably smoother performance. With GEROTOR pumps or motors, hydraulic circuits "run like clockwork", too.

Gerotor May Corporation, Baltimore 3, Md.

GEROTOR

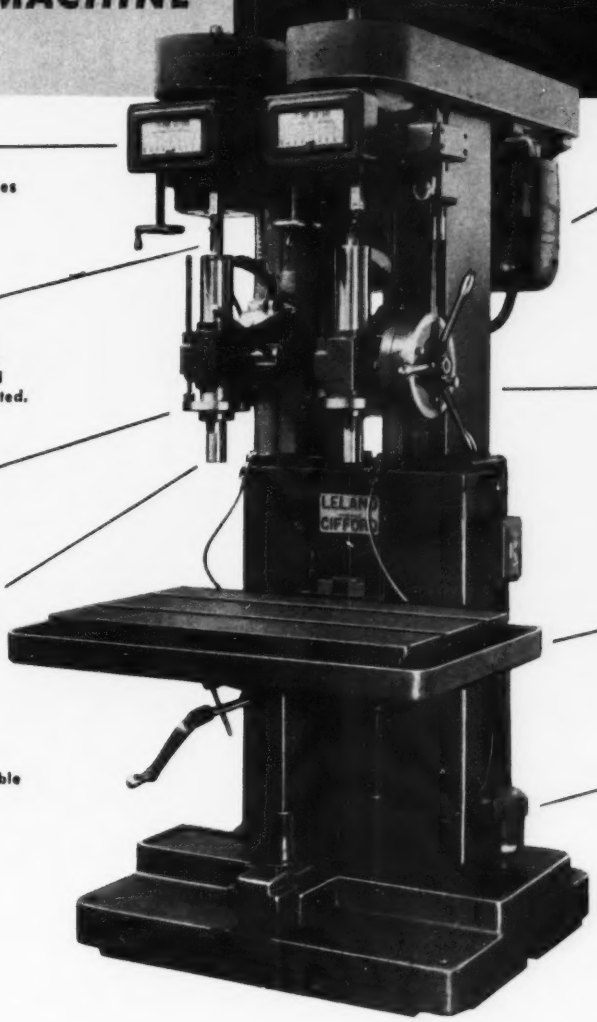
HYDRAULIC PUMPS & FLUID MOTORS

(For more information on products advertised, use Inquiry Card page 245)

ALL THE FEATURES YOU WANT IN A HEAVY DUTY DRILLING MACHINE

the new

LELAND-GIFFORD No. 3 MVB



Leland-Gifford indicating shift for instant speed changes without stopping machine.

20-tooth involute spline spindle for greater rigidity, less wear. Independently counterbalanced and continuously lubricated.

Flanged quill for mounting multiple (spindle) heads.

Capacity of No. 3 or No. 4 Morse Taper.

Base, column and table ruggedly built for maximum rigidity.

Totally enclosed, fan cooled, ball bearing NEMA motor mounted at rear and driving through V belts.

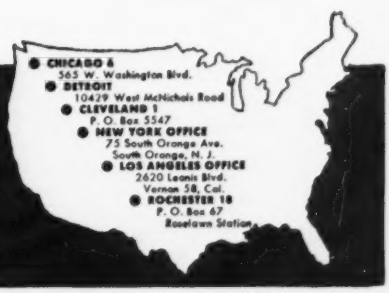
Semi-automatic power feed with 3 feed rates, automatic adjustable depth stop and safety slip clutch. Hand or hydraulic feed also available.

New design table with removable top for easy refinishing.

Coolant pump and tank readily accessible for cleaning.

24" SWING
1 to 4 SPINDLES

Write For Complete Information

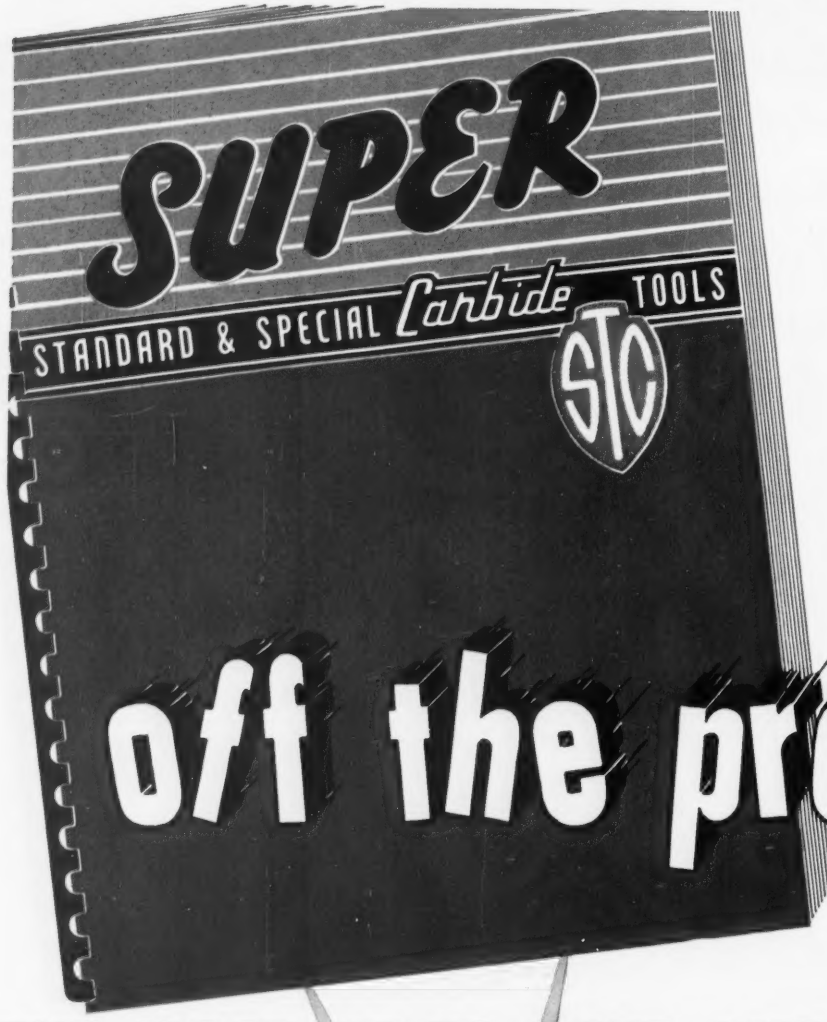


LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

(For more information on products advertised, use Inquiry Card page 245)



off the press!

THE MOST UP-TO-DATE AND COMPLETE CARBIDE TOOL CATALOG AVAILABLE

- ★ A completely new carbide tool catalog, shadow indexed for ready reference.
- ★ 92 pages contain complete listings on Super Standard Carbide Tools, sizes and engineering information.
- ★ Many new carbide tools cataloged for the first time, including an extended line of solid carbides.

Send for your copy today

SUPER TOOL CO.
21650 Hoover Road, Detroit 13, Mich.

Please send me my copy of Super catalog No. 54

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Super
TOOL COMPANY

21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Los Angeles 3, California

(For more information on products advertised, use Inquiry Card page 245)

for Precision
+ Low Cost:

MIKRON

GEAR HOBBER #79

Mikron Hobbing Machines Excel Where High Precision Machining Standards Must Be Maintained



• **MIKRON No. 79** is an excellent choice for small spur gears and pinions. It is simple to operate, to set-up and to change-over from job to job. CAPACITY: Gears, max. dia. $1\frac{9}{16}$"; max. length of cut $1\frac{1}{8}$"; number of teeth 6 to 390; pitch DP 26 and finer.







RUSSELL, HOLBROOK & HENDERSON, INC.

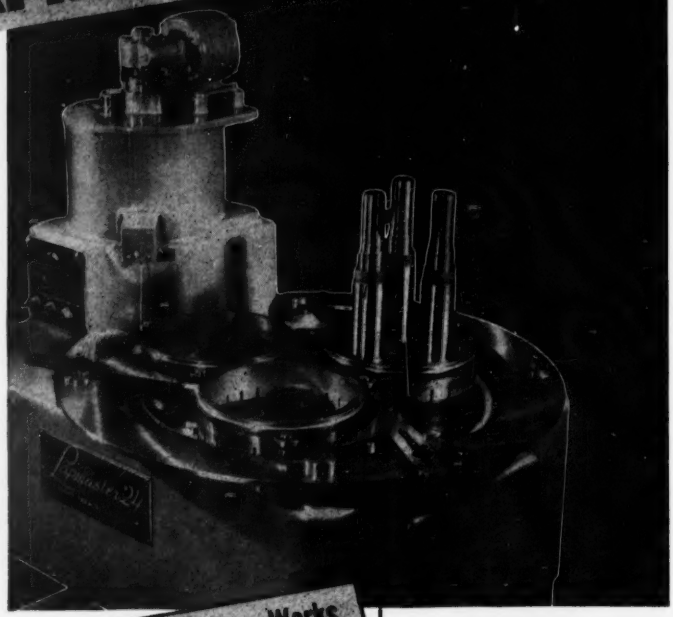
292 Madison Avenue, New York 17, N. Y.

(For more information on products advertised, use Inquiry Card page 245)

WHY YOU GET

Precision Flatness, Finish and Parallelity in Production Quantities . . .

WITH A LAPMASTER

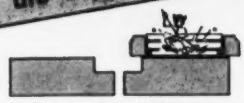


Here is the machine to do the job if you want precision flatness in production quantities at an economical rate. Lapmaster machines readily lap to the extreme close tolerance of one light band (0000116") or less. In addition, they produce an extremely fine finish to as low as 1 RMS.

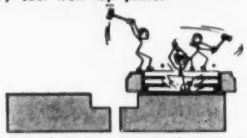
Check these features and investigate the possibilities for the Lapmaster in your plant.

1. Operator requires no previous lapping experience.
2. Automatic timer provides controlled lapping cycle for production efficiency and allows time for pre-loading workholders.
3. Simplicity of design allows ease of loading and unloading.
4. Loose abrasive distributed evenly over lapping area insures uniform results.
5. Serrated lap plate collects and disposes of spent compound and removed stock.
6. Precision laps identical parts or parts of various shapes, heights and materials in one cycle.
7. Self-conditioning lap plate eliminates down time for truing or replacement.

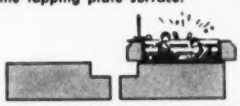
How the Lapmaster Works



The work being lapped causes wear on heavy cast iron lap plate.



As the work is wearing the lap, the conditioning rings are continually conditioning the lapping plate surface.



Since the wear action of the conditioning rings is greater than the wear caused by the work being lapped, the flatness of the lap plate is automatically maintained.

FREE DATA



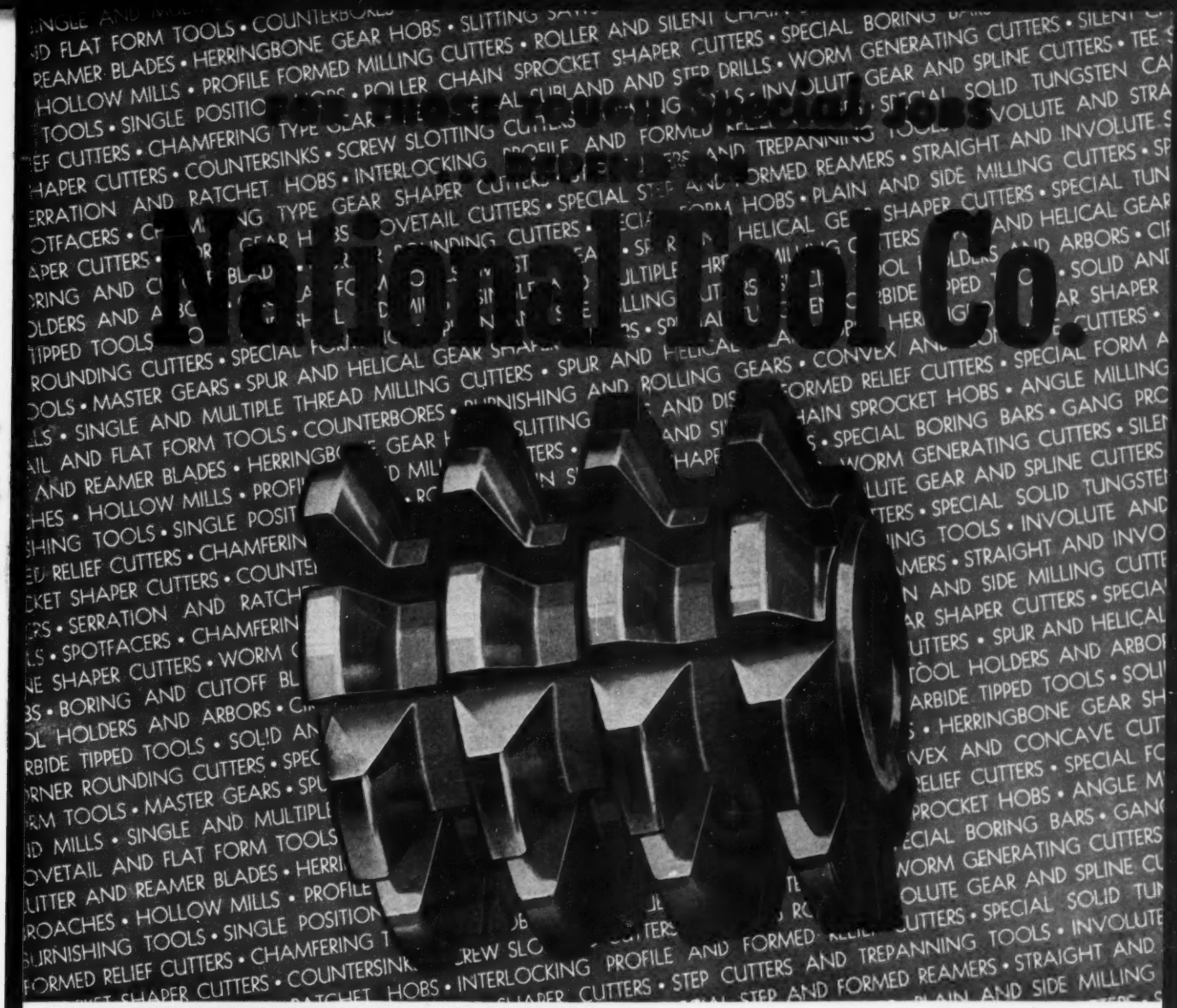
Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

Crane Packing Company, Dept. M-10, 1833 Cuyler Avenue, Chicago 13, Illinois

JOHN CRANE

CRANE PACKING COMPANY

(For more information on products advertised, use Inquiry Card page 245)





Representatives in major industrial centers.

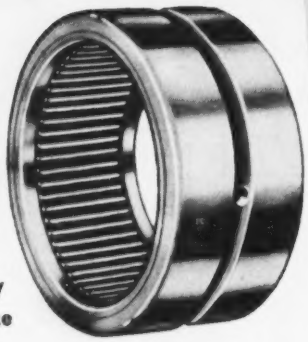
Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National
TOOL CO.
Cleveland 2, Ohio

ORANGE ROLLER BEARINGS

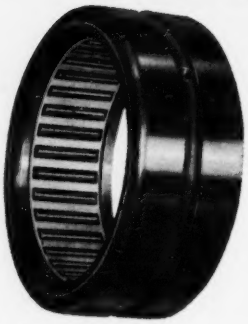
ORANGE ROLLER BUSHINGS



Maximum load capacity in small space

Install these space-saving needle bearings to provide friction-free, long-life operation of rotating and oscillating parts in your equipment. Closer internal running clearances minimize possibility of misaligned rollers. Quiet, even running. Stock sizes ½" to 8" shaft diameters.

ORANGE *Cage Type* NEEDLE BEARINGS

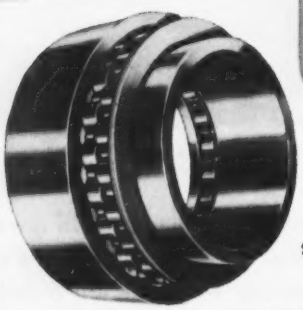


Prevent Roller Skewing

Anti-friction cage keeps rollers permanently aligned in any position—vertical, tilted, horizontal. Successful on overhung mountings and relatively high-speed installations; less affected by misaligned mountings or uneven loading. Extremely smooth, quiet running. Sizes ½" to 8" shaft diameters.

Send for Engineering Data Books
showing dimensions, capacities, shaft and housing tolerances and fits, installation data, etc.

Submit your Engineering Problems
to our field engineers conveniently located in all industrial centers. Our engineering department invites you to submit details or drawings on any bearing application, for recommendation.



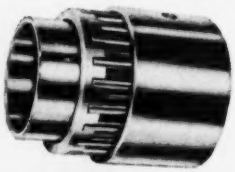
For heavy loads and severe service

ORANGE "STAGGERED" ROLLER BEARINGS





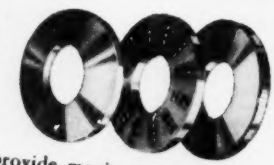
End views show how staggered roller arrangement distributes load over many short rollers. This also prevents skewing tendencies of long rollers and provides more even running. These features often permit use of smaller sizes—always assure longer service life. Full range in 200 and 300 series.



ORANGE JOURNAL ROLLER BEARINGS

Provide high load capacity where radial space is limited, such as shafts close together or adjacent to shoulders. Sizes ¾" to 4" shaft diameters.

ORANGE THRUST ROLLER BEARINGS



Designed to provide maximum roller support for the load, with minimum wear. Available in designs and sizes to meet varying requirements.

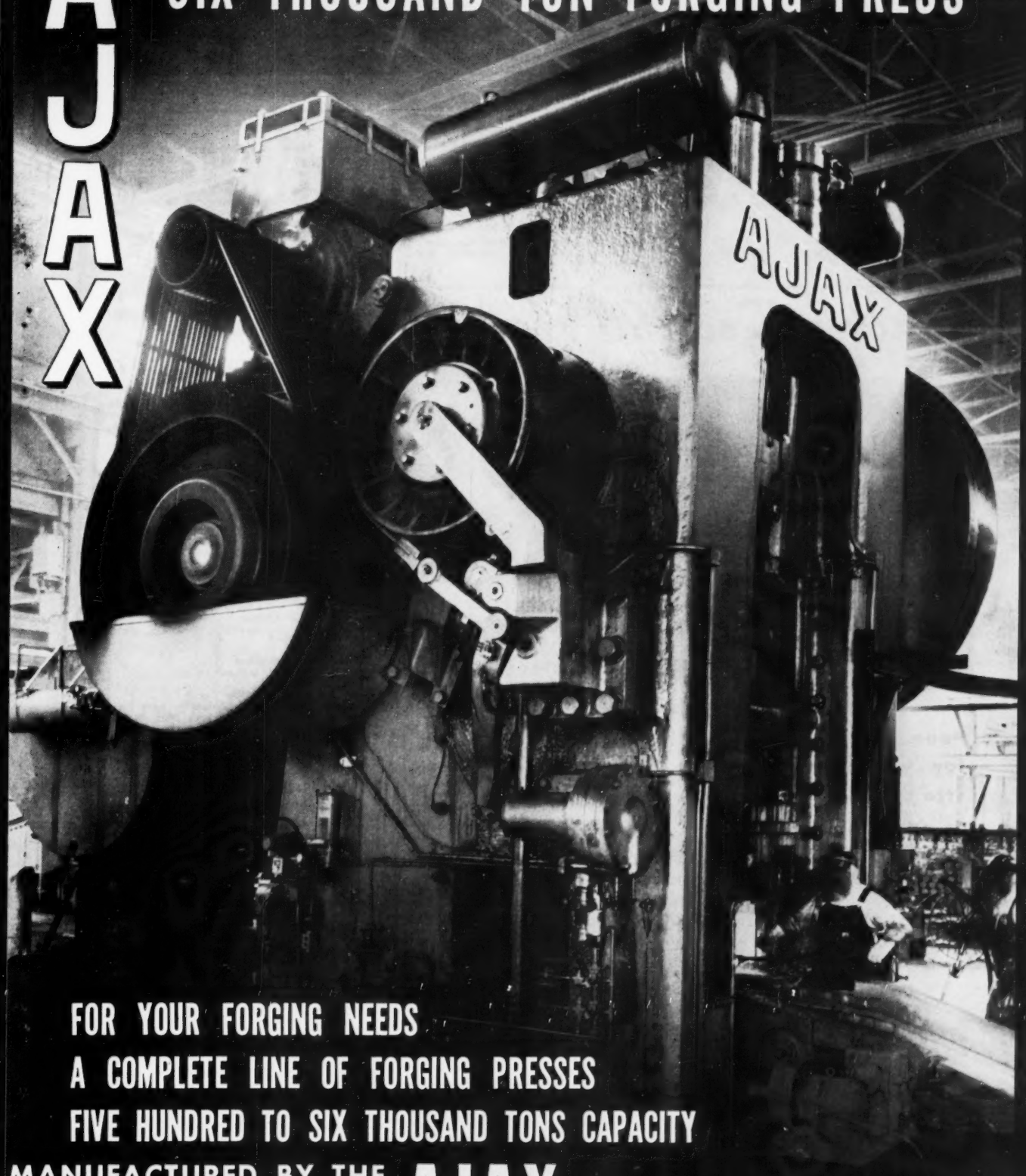
ORANGE

ORANGE ROLLER BEARING CO., Inc. 552 Main St., Orange, N. J.

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AJAX

SIX THOUSAND TON FORGING PRESS



FOR YOUR FORGING NEEDS
A COMPLETE LINE OF FORGING PRESSES
FIVE HUNDRED TO SIX THOUSAND TONS CAPACITY

MANUFACTURED BY THE **AJAX** MANUFACTURING COMPANY

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FOREIGN AGENTS IN PRINCIPAL COUNTRIES OF THE WORLD

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

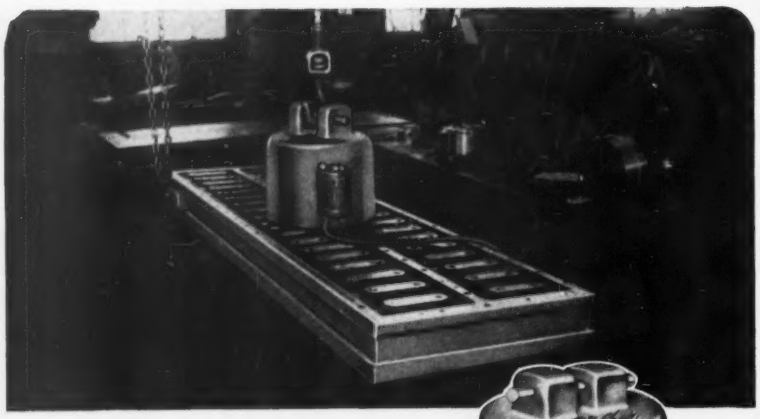
ABRASIVE DISCS
See Discs, Abrasive

ABRASIVES, HONING
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co 254 Laurel Ave., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Walker Does It Again-



Pound for pound, volume for volume, this is the strongest magnet made

WALKER MAGNETS—The utilization of magnetic force under the most efficient conditions is the outcome of Walker's more than fifty years of research and development. . . . The 12" diameter Walker lifting magnet shown holds work up to 5000 pounds.

The Walker material is high in permeability and magnetized to complete saturation with equal flux distribution. . . . The Walker line includes contoured lifting magnets increasing the area of contact for special applications (for wire, pipe, etc.).

Original Designers and Builders of Magnetic Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

IN CANADA — UPTON BRADEEN & JAMES LTD.

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Aluminum
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Magnesium
Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor

ARBORS AND MANDRELS
Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Kea Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 322)

(For more information on products advertised, use Inquiry Card page 245)

Hydroformed!



1 Operation!

JOB FACTS: 22¼" ID vessel drawn to 7⅜" depth from a 32" dia. blank of ⅛" stainless steel in *one* operation. Note part contours and surface detail. Part drawn on 32" Cincinnati Hydroform.

HYDROFORM FACTS: Whether drawing large or small diameter parts, having simple or complex shape, Hydroform users report greatly reduced tool costs—improved part quality—substantial reductions in the required number of operations—many other benefits. Can *you* use these economies? Then investigate Hydroforming *now*. Call in a Cincinnati Milling field engineer. For a description of the five sizes of Hydroform machines—12", 19", 23", 26", 32"—write for your copy of Bulletin M-1759-2.

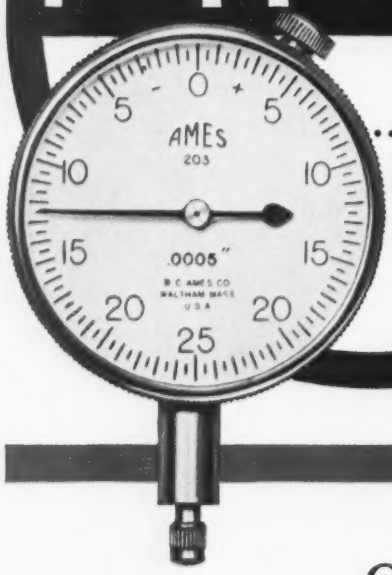
CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U.S.A.

Hydroform

AMES



...the preferred Dial Indicators

One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.



Ames Dial Depth Gauge No. 11C



Ames Dial Micrometer No. 517

Ames Amplifying Dial Comparator No. 26





Ames Small Hole Gauge No. 36



Send today for your free copy of Catalog No. 58

Representatives in principal cities. B. C. AMES CO. *27 Ames Street Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Torrington Co., Torrington, Conn.

BEARINGS, Bronze and Special Alloy

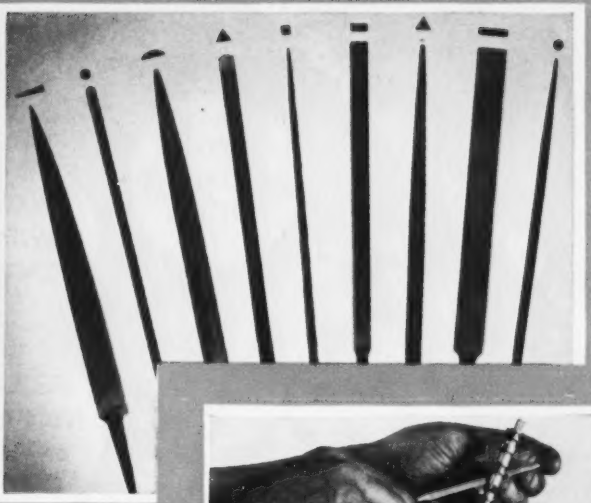
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

(*Continued on page* 324)

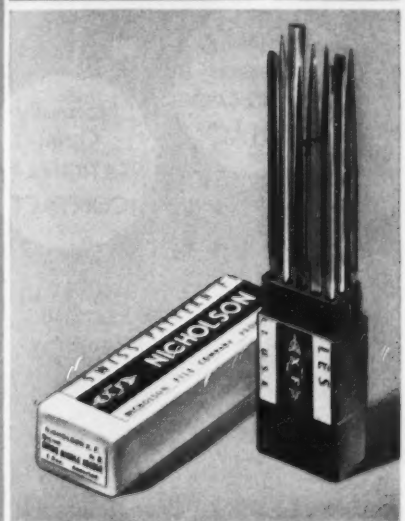
(For more information on products advertised, use Inquiry Card page 245)

For those close-tolerance filing jobs... Nicholson TRADE X.F. MARK Swiss Pattern Files









"WHEN it's got to be *right*, you've got to be *sure*." That's one of the creeds of the tool, die, model and fine-instrument crafts. One rule toward achieving accuracy in precision work is to use tools which in themselves are correct and of the highest efficiency.

For true fits and fine finishes there can be no compromise on file quality, no equivocating on file cost. Nicholson recognizes this principle, and puts "everything it's got" into putting excellence into X.F. (meaning *E*xtra *F*ine) Swiss Patterns. The shaping, cutting, hardening and finishing of these special file types is in the hands of specialists who work on nothing else.

Nicholson X.F. Swiss Patterns differ from American (regular) Pattern files. They are relatively smaller and finer in cut. Tapers are longer and more pointed. Cross sections are more varied. Individual types include those shown above (left to right)—Knife, Round Straight, Half Round, Metal Saw, Square, Pillar Narrow, Three Square, Equaling, Round Tapered. Others: Hand, Warding, Crochet, Barrette, Slitting, Crossing, Corrugating, Joint, Pippin, Testing. Group assortments: Die Sinkers, Die Sinkers Rifflers, Filing Machine, Broach, Round and Square Handle Needle (in 1-doz. plastic-case assortments if desired).

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

NICHOLSON U. S. A.

NICHOLSON FILE COMPANY
18 Acorn St., Providence 1, R. I.

BLACK DIAMOND MADE IN U.S.A.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES *FOR EVERY PURPOSE*



BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Shafer Bearing Div., Chain Belt Co., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Shafer Bearing Div., Chain Belt Co., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Shafer Bearing Div., Chain Belt Co., Downers Grove, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING TRANSMISSION

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.

Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
O'Neil-Irwin Mfg. Co., Lake City, Minn.

(*Continued on page 326*)

(For more information on products advertised, use Inquiry Card page 245)

THIS IS THE CUTTING FLUID YOU TOLD US YOU NEEDED

YOU WANTED STRENGTH OF FILM
which would give you longer tool life

YOU WANTED LUBRICITY
to withstand pressure and reduce friction

YOU WANTED VERSATILITY
one cutting fluid to do 90% of all jobs

YOU WANTED GERMICIDAL PROPERTIES
no rancidity, freedom from skin sores

YOU WANTED COOLER WORK
which could be handled bare-handed

YOU WANTED LOWER COSTS
how's 8¢ a gallon, in the machine?

THE ANSWER IS:

ANTISEP

ALL-PURPOSE BASE

—not a mere water soluble oil, but a fortified concentrate scientifically developed to give you "100 oils in one!"

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

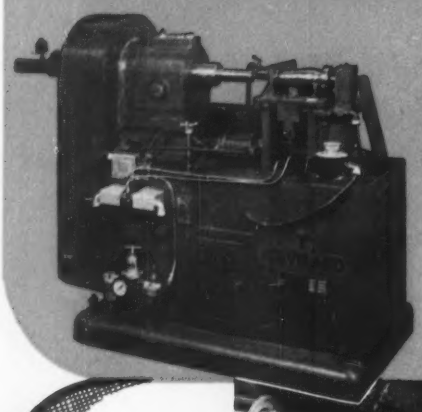
Ready to give you on-the-job service . . .

ANTISEP "saves the day" for Cleveland valve manufacturer—cuts cost 50%!

After several prominent cutting fluids had failed to meet requirements, this concern decided to try Antisep, diluted 25 to 1, in the machining of valve stems from 416 stainless steel. Warner & Swasey 5-spindle automatic screw machines were used. Result: lower costs, improved tool life, greater uniformity in pieces machined. Parts come off cool, permitting higher speeds and heavier cuts.



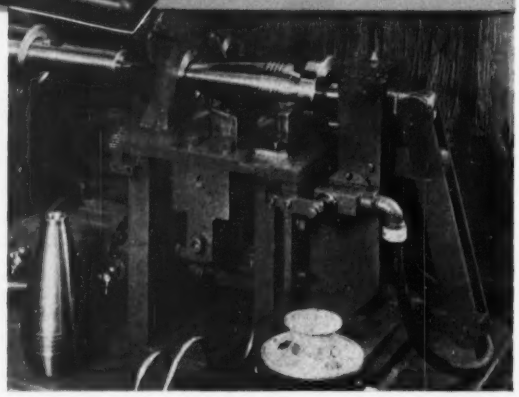
450 pcs. per hour!



Taps .800-16 in 81M Smoke Shell—7/8" STROKE

Another Cleveland Design to Speed Production!

MODEL 1-2 HORIZONTAL



Day after day this Cleveland machine has been turning out an average of 450 pieces per hour! Two cradles operate on a 2 position, air-operated shuttle. Operator loads shell in open cradle and pushes palm start switch. At end of tap cycle in progress the new part is brought into tapping position and the tapped part brought out to one side for unloading.

Cleveland engineers have designed machines to meet the special requirements of scores of plants throughout the country. Because of their know-how—because of the precision tapping achieved at high speeds by Cleveland's famous lead screw feed and because several operations can be combined in one machine—you can be sure of getting more perfect pieces per hour with a Cleveland machine designed for *you*.



Send for your copy of this Guide

Write today for Catalog No. **MA-103**

THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

CANTON 6, OHIO

For Better Tapping--Faster!

CLEVELAND lead tapping machines screw



BENDING MACHINES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Pines Engineering Co., Inc., Aurora, Ill. (Hydraulic)
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BLUING LAYOUT

Dykem Co., 2303 P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Loughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot

O. K. Tool Co., Milford, N. H.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.

(*Continued on page* 328)

(For more information on products advertised, use Inquiry Card page 245)

QUALITY MACHINE TOOLS PRICED TO MEET YOUR BUDGET!

For your complete program in the tool room or the production line these fine European machine tools offer efficiency, precision and *economy!* Constructed of the finest materials and built to meet American standards and specifications they offer excellence at prices that are hard to duplicate.



H & K ENGRAVING MACHINE GM2A

2 dim. working table; 17" x 12"; Panto. movement; Long. 12", trans. 8"; Spindle speeds (6) 2800-15,000 RPM; Motor drive.

Price.....$2511.00

H & K WSR 0 UNIVERSAL TOOL & CUTTER GRINDER

Table movement, Long. 16", cross 10"; Cylindrical grinding length 8-4/5"; Spindle speeds 3000-6000 RPM; Motor 1 HP.

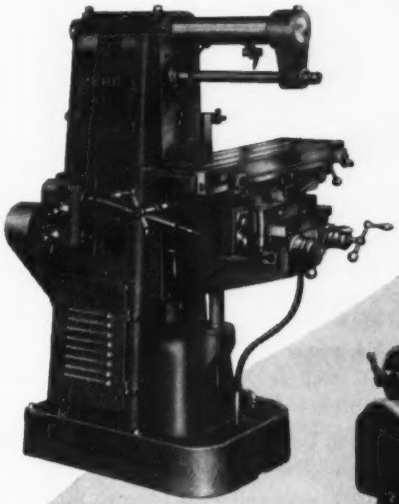
Price.....$2841.00

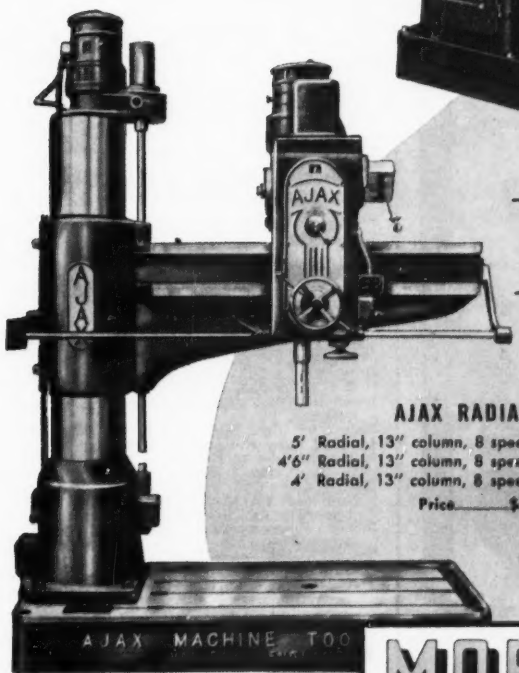


HERO MILLING MACHINE UNIVERSAL 4U (Illustrated) **PLAIN 4P**

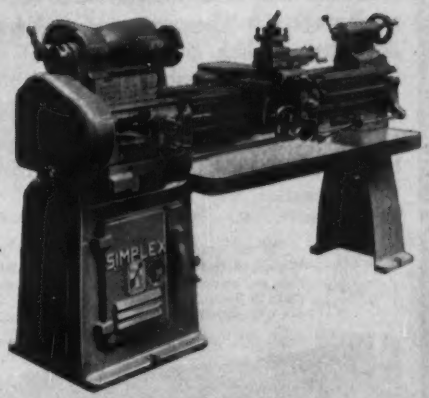
Size of table 30" x 9¼" with 3 T-slots; Long. power travel 18"; Spindle speeds (12) 53-1250 RPM; Motor 2½ HP; Anti-friction bearings; Large table 40" x 9¼" as extra; Accessories available.

Price 4U.....$2795.00
Price 4P.....$2660.00





STOCK DELIVERY



AJAX RADIAL DRILL

5' Radial, 13" column, 8 speeds 60-1114 RPM; #4 M.T.
4'6" Radial, 13" column, 8 speeds 60-1114 RPM; #4 M.T.
4' Radial, 13" column, 8 speeds 60-1114 RPM; #4 M.T.

Price.....$5765.00

13¾" SIMPLEX LATHE
30"-40"-60" C.C.

Engine gap lathes. Quick change gear. Spindle speeds (12) 47-900 RPM; Motor drive.

Price 30".....$1995.00
Price 40".....$2065.00
Price 60".....$2195.00

All prices include standard equipment with motors. For complete information and specifications on any of these machines write, phone or wire . . . Better still, visit our demonstration hall!

AJAX MACHINE TOO

ALL PRICES F.O.B. NEW YORK CITY
SALES TERRITORIES OPEN
Prices subject to change without notice.

MOREY ...for machine tools!

MOREY MACHINERY CO,. INC.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

(For more information on products advertised, use Inquiry Card page 245)

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS



HY-TEN

"B" No. 3X HEAT-TREATED BARS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

This higher-priced alloy steel can save you money!

"B" No. 3X heat-treated bars offer many production economies, even though machined at about ¾ths the speed of annealed bars. They are supplied to your desired physical properties, and can be machined more easily than standard heat-treated bars with equivalent properties. The expense of scaling, distortion, straightening, and often grinding, are eliminated — as well as the cost of extra handling and heat treating of finished parts!

Although the cost is a little more than for ordinary annealed stock, a trial order will convince you of the true economy of HY-TEN "B" No. 3X heat-treated bars! Just call your nearest WL representative.

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.



WHEELOCK, LOVEJOY & COMPANY, INC.

HY-TEN and AISI

Warehouse Service

CAMBRIDGE • CLEVELAND
CHICAGO • HILLSIDE, N. J.
DETROIT • BUFFALO
CINCINNATI

In Canada
SANDERSON-NEWBOULD, LTD., MONTREAL

138 Sidney St., Cambridge 39, Mass. and Cleveland • Chicago • Detroit Hillside, N. J. • Buffalo • Cincinnati

Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING AND TURNING MILLS, Vertical

American Steel Foundries King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING BARS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Homestrand, Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Portage Mch. Co., Sweitzer Ave., Akron 11, O.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

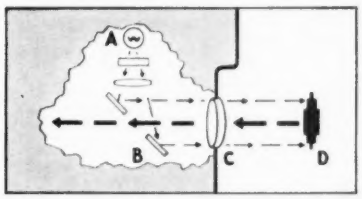
(*Continued on page 330*)

(For more information on products advertised, use Inquiry Card page 245)

Plain Pointers on Projection

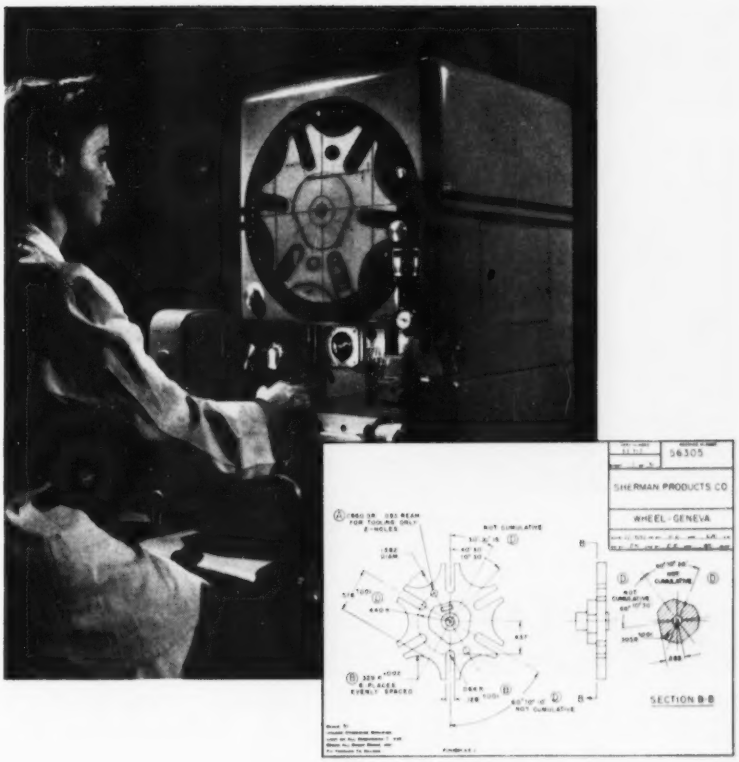
ONE of the basic precepts of the study of geometrical optics is that the angle of incidence equals the angle of reflection. This law, recognized by the Greek philosophers and refined by later investigators, has an important bearing on modern optical gaging by projection. In numerous instances it is desirable to project the surface of a part on the screen to check the position and size of recesses or to measure features which may not permit conventional profile shadow images. The ease and success with which this is done depend not so much on how much light is thrown on the part as on how much of this light is reflected back into the instrument's lens.

Traditionally, surface illuminators used with contour projectors have been placed at an angle on each side of the lens or optical axis. This was true of the pilot model of the Kodak Contour Projector and we frankly admit it proved somewhat less than perfect. Since the light struck the part at an acute angle, it was reflected from the surface at a similar angle—reflected away from the lens, as it were, when the part was normal to the lens for a distortion-free image.



However, between design of this pilot model and our production models, our optical engineers devised a radically different system. As shown here schematically, this consists of a 1000-watt lamp (A) so mounted that its light is reflected by a mirror (B) through the front lens (C) of the instrument. Since the light from this surface illuminator travels along the axis of the lens, it is reflected from a part (D) back through the lens with negligible loss. By staging the part to be measured perpendicular to the optical axis, the angles of incidence and reflection approach zero degrees. Light is reflected from the part back on its own path.

This permits inspection of deep recesses and results in a screen image of unusual brilliance when projecting surfaces. The latter we have frequently demonstrated by placing the works of a small watch on our contour projector. Spectators are generally impressed to see the wheels and gears in motion, and on at least one occasion we've had a watch brought to us for repair. While this was perhaps somewhat embarassing, we're reconciled by the thought that users of our projectors are saved embarrassment daily because of the accuracy with which they can gage parts to "tenths."



Inspection costs fall when surface features and profiles are checked simultaneously

YOU may be missing a chance to lower inspection costs, speed the work, if you're overlooking the surface illumination feature of the Kodak Contour Projector.

Take the Geneva wheel shown here. By optical gaging, 47 dimensions are checked to tolerances of .001" in *less than 60 seconds,* using a single chart-gage and a simple staging fixture. Conventional shadow projection is used to check 36 of these. But only through surface projection can the 11 dimensions of the hub, including five angles and three radii, be checked simultaneously. A flick of a switch and the unique, self-contained surface illuminator (described in the column at the left) makes checking surface details as easy as measuring shadow profile.

The inherent speed and accuracy of inspection and measurement on Kodak Contour Projectors are lowering inspection costs on all sorts of parts, simple and complex, large and small. The field representative in your area will be glad to show you how optical gaging can work for you. To get in touch with him, or for a copy of a booklet, "Kodak Contour Projector," write to:

Special Products Sales Division
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

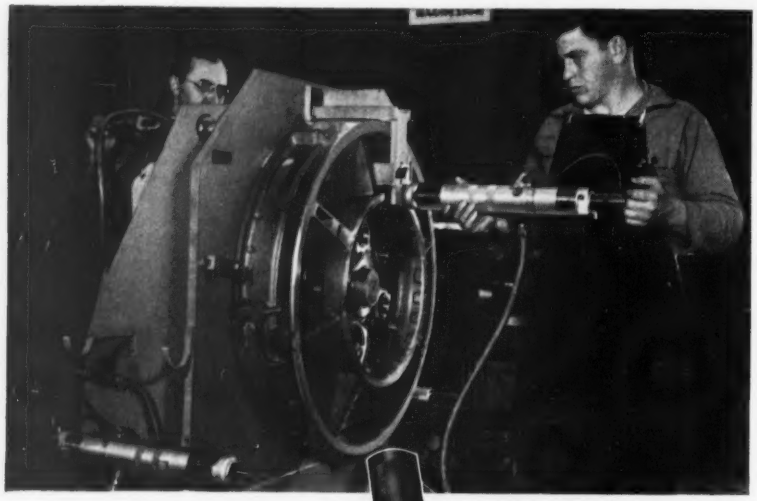
the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak

(For more information on products advertised, use Inquiry Card page 245)



ANOTHER EXAMPLE OF *KELLER Air Tools engineered to industry*

USE KELLER *Airfeedrills* for accurate automatic drilling

Keller Airfeedrills are recommended where extreme accuracy is needed, especially where the job cannot justify the space or cost of expensive machine tools; as in the case shown above where Keller Airfeedrills make the locating holes for machining jet engine parts . . . work which must be done to extremely close tolerances. Note the inexpensive fixture required.

Used on close centers and in tight places

Easily shifted from job to job

Drills metal, wood, composition, plastics



Facts in Brief about Keller Airfeedrills

Accurate holes without costly fixtures

Attaches in any position, at any angle

Air operated—hydraulically controlled

Pneumatic cycling to speed production



Keller Tool Company, Grand Haven, Mich.

Please send me a free copy of your booklet titled, "The HOLE Story of the Keller Airfeedrill."

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

Send for **FREE** **24** Page Booklet for more information about automatic drilling with Keller Airfeedrills

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Mummert-Dixon Co., Hanover, Pa.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.

BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BRAKES, Press and Bending

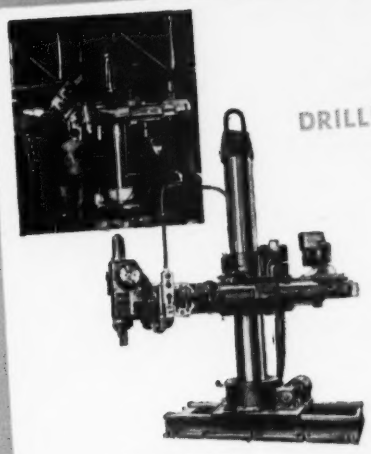
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Machinery & Engrg. Corp., Hamilton 1, O.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Verson Alisteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

(*Continued on page 334*)

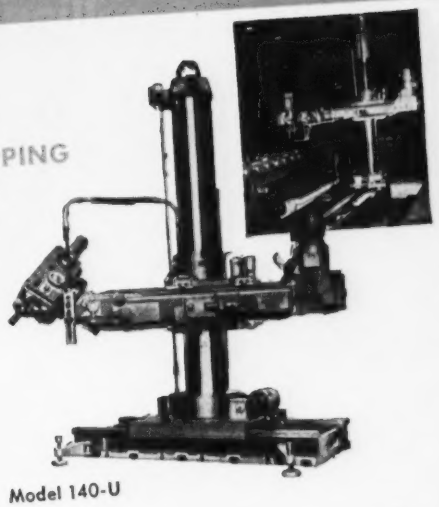
(For more information on products advertised, use Inquiry Card page 245)

Kaukauna UNIVERSAL AND HORIZONTAL DRILLING AND TAPPING Machines

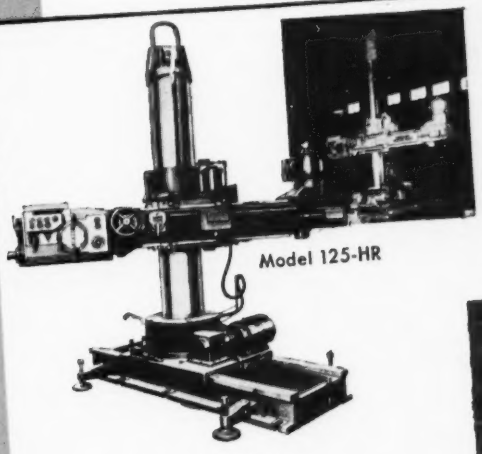
UNIVERSAL DRILLING and TAPPING MACHINES



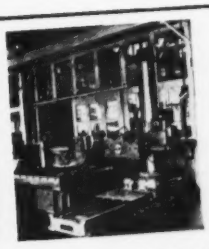
Model 125-U

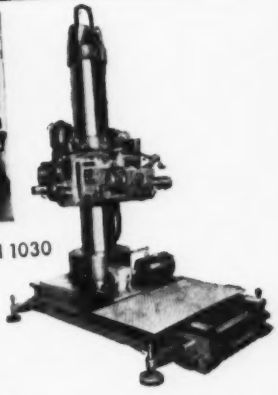


Model 140-U



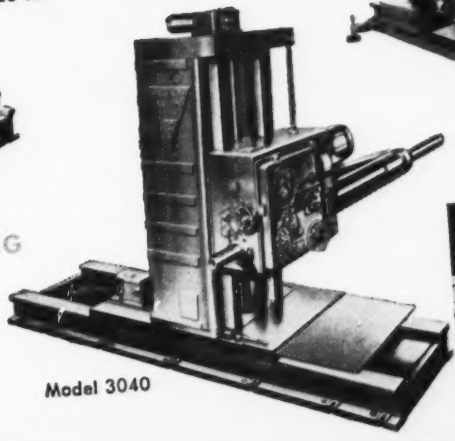
Model 125-HR



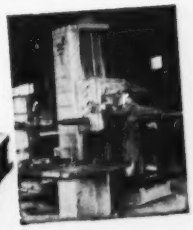


Model 1030

HORIZONTAL DRILLING and TAPPING MACHINES



Model 3040



WRITE FOR COMPLETE CATALOG

KMC

Kaukauna MACHINE CORPORATION

KAUKAUNA, WISCONSIN, U. S. A.

(For more information on products advertised, use Inquiry Card page 245)



HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION

(For more information on products advertised, use Inquiry Card page 245)

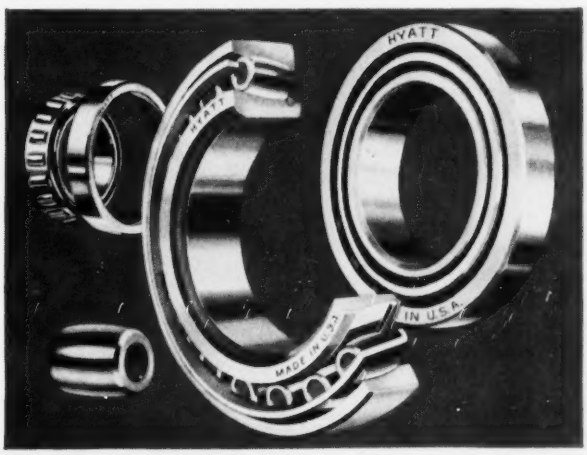
YATT BARREL BEARING

now available in volume!

Hyatt is rolling out the barrels! . . . and a familiar shape is giving a big lift to modern industry! A new Barrel Bearing —pioneered and perfected by Hyatt—is available in volume for the first time! There's no other bearing quite like it—and it's ready for a starring role in industrial production!

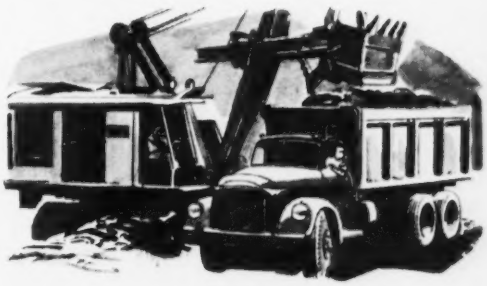
The Barrel name comes from the barrel shape of the rollers . . . but its superiority in bearing applications comes from *dual-purpose design* and *self-aligning ability!* This unique bearing takes load from any direction . . . and operates at full load-carrying capacity under conditions of misalignment! And in addition, the barrel shape of the rollers combines the low rolling friction of a ball with the high load capacity of a cylindrical roller—so that the Barrel Bearing is ideal for a wide range of applications.

Expensive? *Not at all!* Advanced manufacturing processes —plus the facilities of one of the newest and finest bearing plants in the world—make the initial cost far lower than you would expect! . . . For full information on this newest solution to the friction problem, write to the address below.

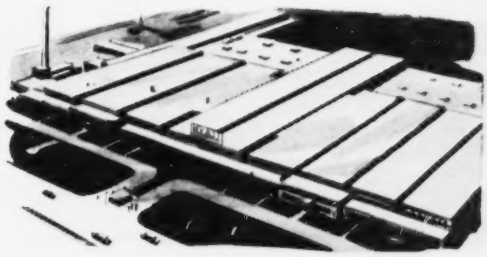




Self-aligning action makes the Barrel Bearing ideal for tractors and farm implements. Over many years, its durable, dependable performance has been established in a wide range of these applications.



In trucks and construction equipment, too, Hyatt's Barrel Bearing operates with full efficiency under conditions of heavy, multiple-direction loading. Unique roller and race design distributes the load over large areas of contact.



Hyatt's new plant, in Clark Township, N. J., is among the most modern in the world. New equipment makes possible advanced manufacturing processes, and research facilities are the finest in the bearing industry.

YATT

ROLLER BEARINGS

HARRISON, NEW JERSEY

(For more information on products advertised, use Inquiry Card page 245)



WHY WE SPECIFY

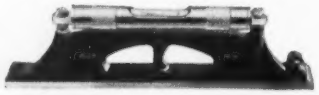
LUFKIN LEVELS . . .

No. 59 MASTER PRECISION LEVEL

FOR EXTRA ACCURACY — Special alloy base is less affected by temperature changes. Accurately ground and graduated vial of 10 second accuracy, one division equalling .0005 of an inch per foot. Fine, positive adjustment with extra sensitive (64 threads per inch) screws. Auxiliary level shows lateral position. 15" length.

FOR EXTRA DURABILITY — Design gives maximum protection to vials. Top plate made of special non-conductive insulating material. Made from thoroughly seasoned castings. Machined surfaces scraped with extreme care. Non-machined surfaces have durable black crackle finish.

No. 57 & 58 MACHINISTS LEVELS



The shallow "V" in the base of Lufkin Machinists Levels No. 57 and 58 is preferred by mechanics and tool setters because better contact is obtained on shafting. The main vial on No. 58 is graduated with each graduation equal to .005 inches per foot. The vial on No. 57 is plain. Micrometer type thread permits fine adjusting. Outer metal tube can be turned to protect main vial when not in use. Made in 6", 8", 12" and 18" lengths.

WRITE TODAY FOR NEW TOOLS BOOKLET DESCRIBING LUFKIN LEVELS

BUY LUFKIN TAPES • RULES • PRECISION TOOLS From Your Distributor

275

THE LUFKIN RULE CO., SAGINAW, MICHIGAN
132-138 Lafayette St., New York City • Barrie, Ontario

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Atrax Co., Newington, Conn.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.

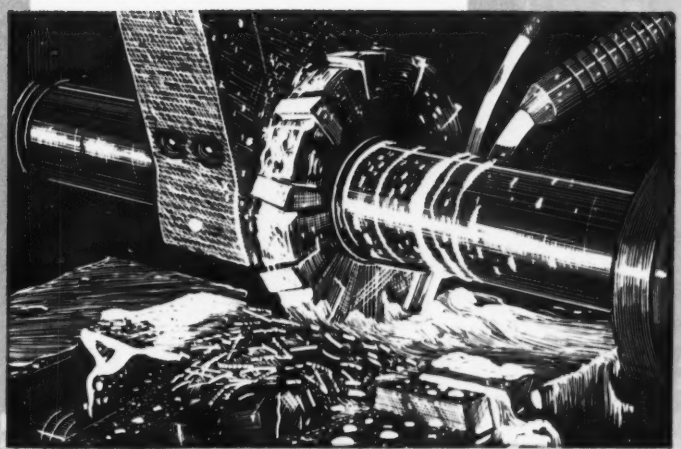
(*Continued on page* 338)

(For more information on products advertised, use Inquiry Card page 245)

OK MILLING CUTTERS IN THE AIRCRAFT INDUSTRY—NO. 6

OK alternate angle cutter

rough-mills slot in forged steel counterweight for world's most powerful piston aircraft engine



OK ALTERNATE ANGLE MILLING CUTTER, MOUNTED ON CINCINNATI HYDROMATIC, MILLS RADIAL SLOT IN COUNTERWEIGHT FOR PRATT & WHITNEY AIRCRAFT WASP MAJOR ENGINE.

GETTING high production from milling operations in the aircraft industry with its special formula steels and close tolerances, is a challenge to the best men in the business.

Examine this picture. Note the machine is a Cincinnati vertical hydromatic with a powerful motor. Look at the size of the spindle shaft, the way it is supported, the ruggedness of the fixture to hold the workpiece.

OK alternate angle cutters give good service because the angular set of the blades gives a shearing action, requiring less horsepower than straight bladed cutters. This shearing action also produces a better finish, lengthens the time between grinds. The fine adjustment incorporated in OK alternate angle cutters at no extra cost reduces grinding to less than .005" per blade after adjustment to compensate for wear. These cutters are frequently used in gangs, spaced, or in close formation for slab milling jobs.

All OK cutters have the inherent advantage of simple two component construction—body and blades. No locks, blocks, screws, gibs or wedges are needed. No recesses are made in the body to accommodate them. Blades once driven home, cannot move. Mated serrations prevent tipping or slipping. This simple construction enables OK cutters to carry more blades for finishing cuts, heavier blades for roughing cuts.

Write for OK Tool Catalogs

"MODERN MILLING CUTTERS FOR MODERN MILLING MACHINES"
"AMERICA'S FIRST SYSTEM OF SINGLE POINT TOOLS"

TWO COMPONENTS—BODY AND BLADES
SIMPLE . . .
STRONG . . .
SUFFICIENT . .



OK

modern milling cutters for modern milling machines

THE O.K. TOOL COMPANY INC. Milford 6, New Hampshire

(For more information on products advertised, use Inquiry Card page 245)

GOT A TOUGH CENTERLESS GRINDING PROBLEM

HERE'S THE GRINDING WHEEL THAT WILL ABSOLUTELY SOLVE IT!

CINCINNATI Grinding Wheels are made to team-up with centerless grinders for the smartest solutions to industry's toughest grinding problems. And with a Cincinnati Milling-trained machinist on the spot to help you get the most out of CINCINNATI Grinding Wheels, you can count on the *right answer* – FAST!

Here's why we're so sure that CINCINNATI Grinding Wheels will help you solve that tough centerless grinding problem:

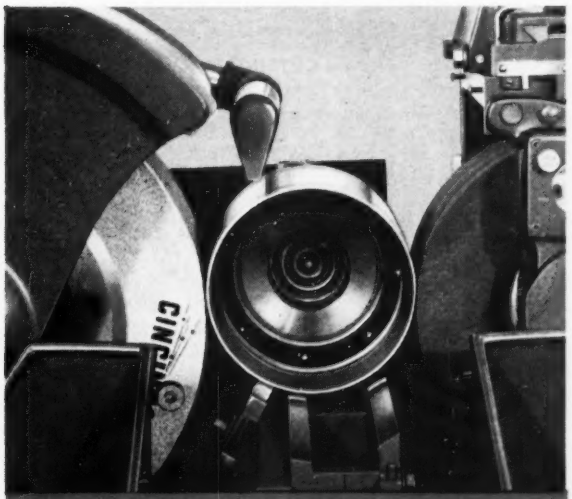
CINCINNATI Grinding Wheels are used by – and *developed* by – Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.



CINCINNATI Grinding Wheels have solved hundreds of centerless grinding problems involving finish, roundness, taper, sizing and production.

2 We've solved hundreds of centerless grinding problems using CINCINNATI Grinding Wheels. These problems include a complete variety of centerless grinding troubles – such as finish, roundness, taper, sizing and production.

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience based on an entirely new approach to grinding wheels – the development of the grinding wheel as a true cutting tool.



Here's a tough one! Large volume of metal to be removed, involving high heat, while holding close tolerances on a large part easily distorted by pressure. (See Case History at right.)

We are so confident – *so absolutely sure* – that CINCINNATI Grinding Wheels can help solve your tough centerless grinding problem that we make this *unconditional offer* – either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

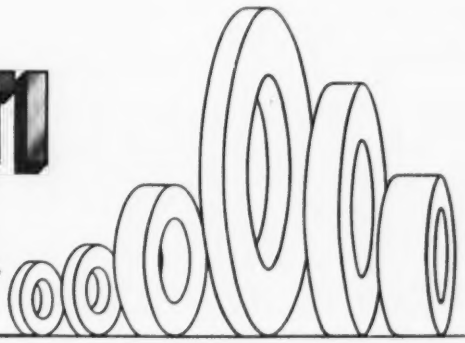
CASE HISTORY No. 637

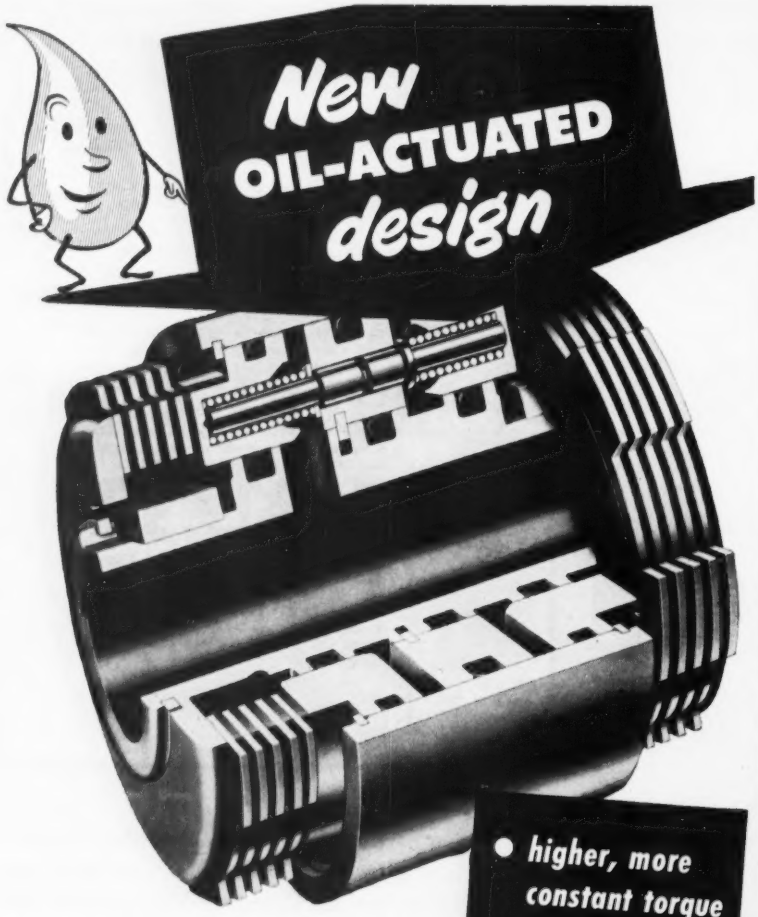
How CINCINNATI Grinding Wheels Solved Tough Grinding Problem

The job	Diesel Engine Piston, 8½" Dia. x 9" long x 3/16" wall, alloy cast iron, 217-302 Brinell. Stock removal .010-.015". Tolerance - straight and round .002", finish 20-50 RMS. To be ground in one pass.
The machine	Cincinnati No. 3 Centerless (altered).
The problem	Close tolerances to be held on a large part that is easily distorted by pressure. Large volume of metal to be removed (about 1½ cu. in.) involving high heat.
The solution	Close collaboration between production men, machine tool men and grinding wheel men resulted in a notable solution to a difficult job. Tolerances are successfully held. Grinding time, under shop conditions, is 1.1 minutes per piston. Six pistons are ground between dressings. The wheel is a Cincinnati 4A46-I5-VN, regular aluminum oxide instead of the more conventional silicon carbide. It not only costs less but reduces diamond wear which is important, considering the width of the wheel (10") and the close tolerance for taper.

If you have a tough centerless grinding problem, contact us at once. We'll send one of our expert machinists – men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless grinding problem. There is no charge for the service of this expert machinist. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio





Check the features of this new line of multiple plate clutches: Integral oil cylinder clamps plate stack, automatically maintaining constant torque . . . *eliminating* all need for adjustment. *High torque capacity*—directly proportionate to oil pressure—permits use of smaller, more compact clutch. *Readily adaptable to remote control,* thus eliminating complicated actuating linkage.

That's the performance you'll get from the new Twin Disc Model MOS (single) or MOD (duplex) Oil-Actuated Multiple Plate Clutch.

Write for complete information.

Model MOD (duplex) Oil-Actuated Multiple Plate Clutch—cutaway view shows integral oil-cylinder. Also available in Model MOS (single).

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U.S. PAT. OFF.

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
New England Mch. & Tl. Co., Berlin, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Landis Tool Co., Waynesboro, Pa.
New England Mch. & Tl. Co., Berlin, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930-44 W. Harrison St., Chicago, Ill.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

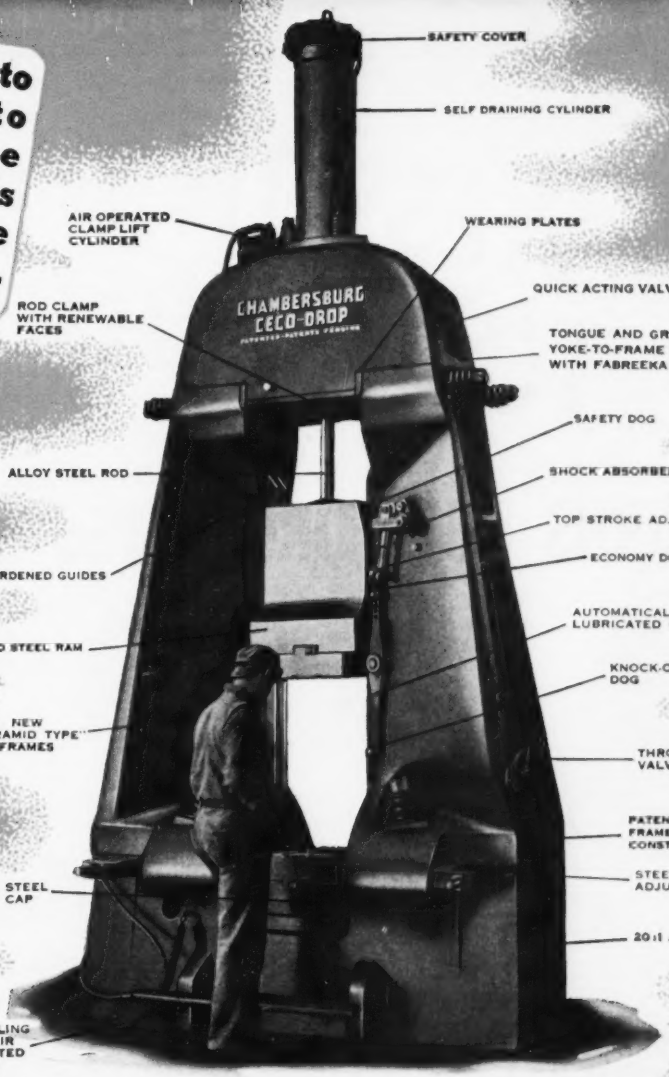
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Hansell-Elcock Co., 485 W. 23rd Place, Chicago 16, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

(*Continued on page* 342)

(For more information on products advertised, use Inquiry Card page 245)

You owe it to yourself to learn more about this remarkable hammer . . .

Write for Bulletin 11-L-O



CECO-DROP

• *The Boardless Gravity Drop Hammer* •

No Boards • No Front Rod • No Back Rod
Costs less to operate . . . Forges more minutes per hour . . . Is safer and easier to operate . . . This hammer is setting new records in cutting forging costs and in increasing production.

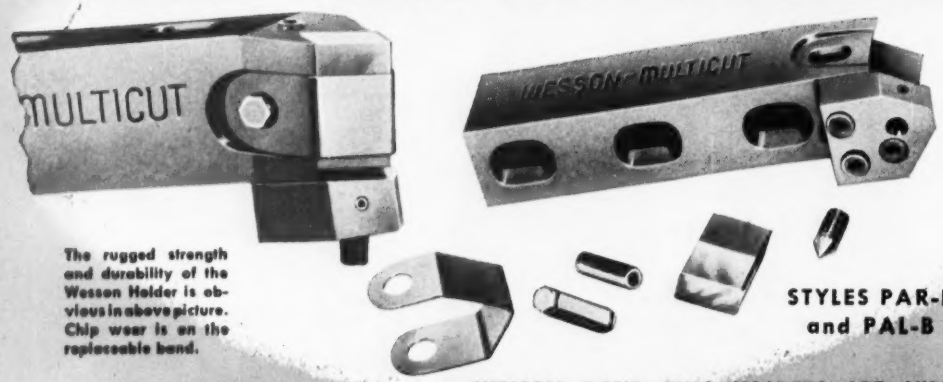
CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

Combine WESSON TOOL ENGINEERING SKILL and EXPERIENCE

Our 30th Year In Carbide!

This New WESSON Engineered TOOL HOLDER

ROUGH TURNS HOT FORGED 155 MM SHELLS



The rugged strength and durability of the Wesson Holder is obvious in above picture. Chip wear is on the replaceable band.

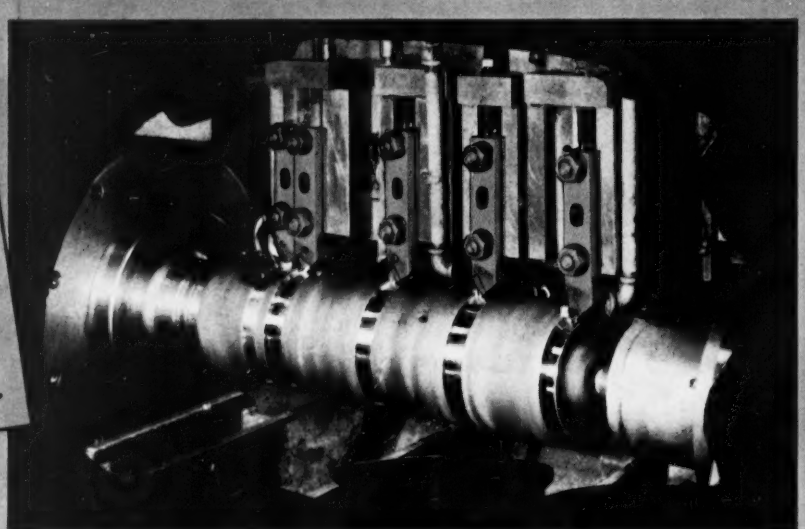
STYLES PAR-B and PAL-B

WESSON MULTICUT PARALLELOGRAM BAND TYPE HOLDER

WESSON BAND TYPE HOLDERS ARE VIRTUALLY INDESTRUCTIBLE EVEN UNDER ABNORMAL CONDITIONS. THE STEEL BAND IS REPLACEABLE AT VERY LOW COST. 101 DIFFERENT STANDARD STYLES AND SIZES ARE AVAILABLE.

ACTUAL JOB SETUP NOW AT A LARGE SHELL MANUFACTURING CO.

Part.....155 MM hot forged shell.
Operation.....Rough turning.
Machine..Burleigh Stocker Hydre-Feed automatic lathe.
Tools.....5 Wesson Multicut Band Type Parallelogram Tool Holders with Parallelogram Wesson-metal insert grade WM.
Depth of cut.....Up to 1" maximum.
Feed.....032 per revolution.
S.F.M.....320.



This photo, taken while the machine was running shows the depth of cut and type of finish obtained by rough turning with Wesson Holders and Wesson-metal insert. Note extra holder strength possible with the parallelogram insert. The lead angle is 25°.

The Wesson Tool Engineer in your area has full details on this job. Ask him about Case History #135.

WESSON COMPANY

1220 WOODWARD HEIGHTS BLVD. FERNDALE (DETROIT 20), MICH.

with WESSONMETAL HIGH PERFORMANCE *for Increased Production . . .*

. . . . . And *This*

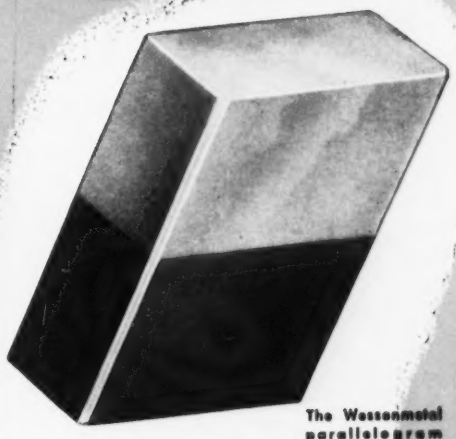
WESSONMETAL INSERT

WITH CUTS UP TO 1" DEEP!

Another FIRST for WESSON

with Tool Costs Reduced by Over 60%
Production Increased 400%

OLD METHOD	NEW WESSON METHOD
Tool Cost.....$37.50	Tool Cost.....$50.00
Useable Carbide.....3/8"	Useable Carbide.....9/16"
Average Pieces per Grind...60	Average Pieces per Grind...60
Pieces Machined per Tool..420	Pieces Machined per Tool..1680
Tool Cost per Piece.....8.1c	Tool Cost per Piece.....2.9c
Down Time for Tool Change... 15 min. every hour	Down Time for Tool Change... 4 min. every hour



The Wessonmetal parallelogram type insert is designed for strength and durability.

½" x 1" x 1½" either solid or with brazed steel slug on bottom for back up screw contact.

WESSONMETAL IS OUTSTANDING FOR HIGH PERFORMANCE BECAUSE IT IS UNIFORMLY DEPENDABLE IN QUALITY

WESSONMETAL is available in 8 grades for all types of metal working.

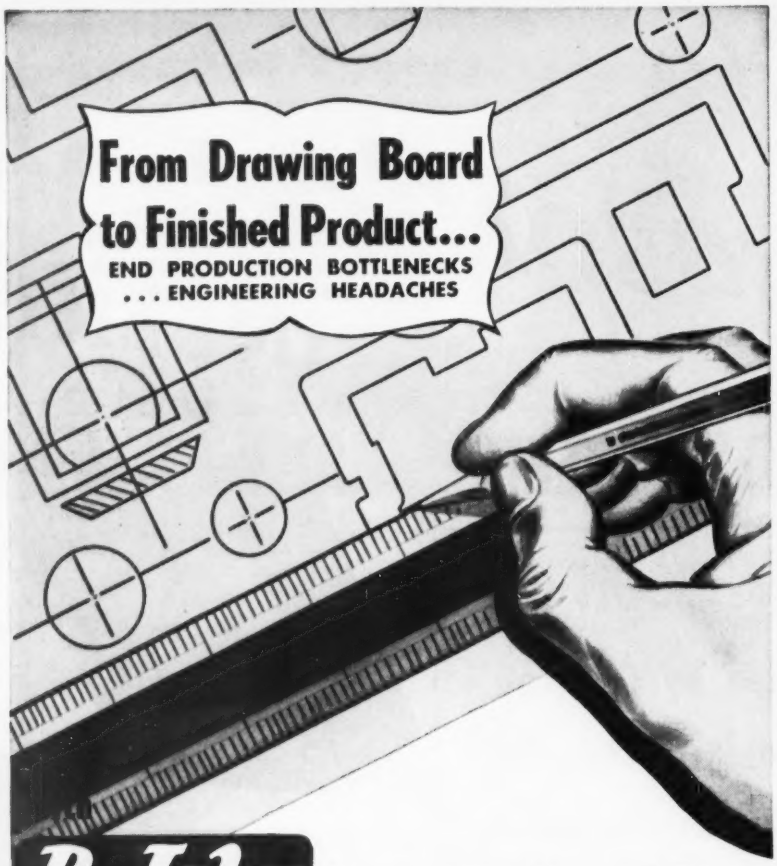


SEE THE DRAMATIC STORY OF CARBIDE in Sound and Color "THIS CARBIDE AGE"

There's a Wesson Tool Engineer in your area who will give you full details about this fine educational movie. Call him or write.

WESSON METAL CORPORATION

LEXINGTON 34, KENTUCKY

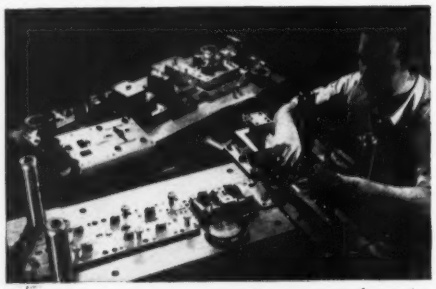


B. Jahn Production Proved Dies!

Top flight engineers specify "B. Jahn Dies" as a shortcut from drawing board to delivery date. The design and craftsmanship embodied in every B. Jahn Production Proved Die eliminates all guesswork, all trial and error — guarantees flawless die performance . . . die economy . . . die quality!

Thorough inspection of this 10 station progressive die for producing clips to link 60 caliber machine gun shells insures minimum time from production line to battle line. PRODUCTION PROVING from 10 to 50,000 pieces from the die guarantees "proving ground" quality like this —





1. B. Jahn recommends the *right* tools and dies for each specific requirement.
2. Progressive dies — single dies — tools for multiple slide machine or dial press use — are recommended only when substantial production savings can be realized.
3. B. Jahn dies are designed in sections for ease and economy of repair whenever advisable.
4. Carbide inserts are built into trouble spots and all points subjected to excessive wear for longer tool life, resulting in lower production costs.
5. B Jahn dies are ground all over after hardening, upon request, for outstanding performance and economy



SEND FOR THE "B. Jahn Story" TODAY!

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Adams Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Thor Power Tool Co., Aurora, Ill.

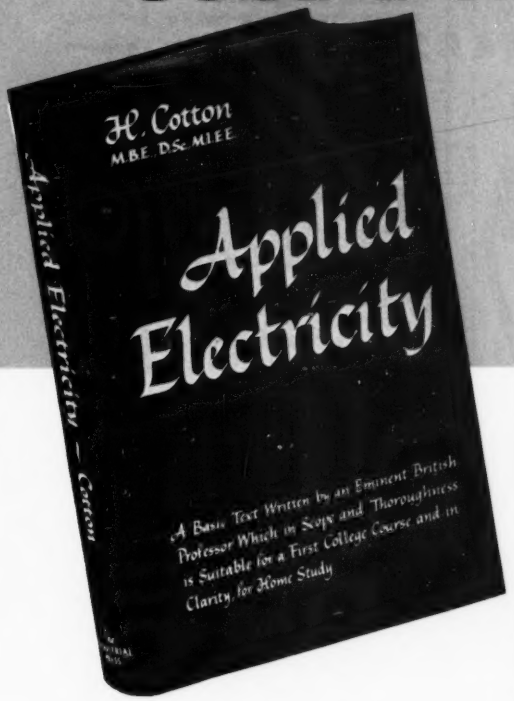
CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

(*Continued on page* 344)

(For more information on products advertised, use Inquiry Card page 245)

JUST PUBLISHED . . . . .



"A GOOD Basic Text on Electrical Theory"

If you need a good basic text on electrical theory in your work or in your studies you will find "Applied Electricity" complete, clearly written and moderately priced. It is an elementary, yet thorough textbook that is designed as a basic text for the student, and as such it is ideal for use in a first course in colleges and technical schools. In addition, its completeness and simplicity make it a practical reference work for home study, or for engineers whose fields of activity are concerned with electrical problems.

Written by H. Cotton, Professor of Electrical Engineering at Nottingham University, England, in a style that is lucid and easy to follow, it is arranged in a logical manner that covers all the basic principles thoroughly with a minimum of references to other works. The list of contents at the left gives an indication of its thorough coverage of all the basic phases of electrical theory and all the fundamental types of electrical equipment. Over 300 well-drawn diagrams supplement the text and illustrate clearly the subjects under discussion. In addition, important rules and formulas are highlighted by outlining them in box fashion. Plenty of worked-out examples are provided in the text, and at the end of the book there are thirty additional pages of problems, a set for each chapter, with answers. A most important feature is a comprehensive account of the meter-kilogram-second (M.K.S.) system of units. There are also sections on the triode tube, the photocell, and a chapter on circle diagrams.

Whether you are a beginning student or a practical engineer, you will find "Applied Electricity" useful. Send for your copy of this book now, examine it free for five days, and we are sure that you will want to make it a permanent addition to your reference library.

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Examples (with answers)

$4.50

Postpaid in U.S.

476 Pages
387 Diagrams

THE INDUSTRIAL PRESS
148 Lafayette St., New York 13, N.Y.

Please send me a copy of "Applied Electricity" postpaid. If I decide to keep the book, I will send payment of $4.50 within five days.

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M-10/53

HOW DID THE *screw* GET ITS NAME?





The word "screw" is supposed to come from the Latin "scrofa" which has been defined as "a digger," from the habit of swine, who are fond of rooting up the earth with their noses. However, at least one man disagrees with the explanation. He figures that the etymologists have picked the wrong end of the pig. To him, the curly tail looks more like a screw than the nose does. Heads or tails, tradition has made the word part of the language.

Today, Allmetal—maker of stainless steel screws, bolts, nuts, and many other stainless fasteners—owes its good name to a tradition of high quality and fast service. If you need anything from our line, just give us the word.

Our 96-page catalog contains engineering data and weights as well as sizes and dimensions of stock items. If you want a copy, send us a note on your letterhead. Ask for catalog 53Z.

STAINLESS FASTENERS

ALLMETAL
SCREW PRODUCTS COMPANY, INC.
821 STEWART AVE., GARDEN CITY, L. I., N. Y.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Durable Products, 816 W. 50th St., Minneapolis 19, Minn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

Van Norman Co., 2640 Main St., Springfield 7, Mass.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Drill

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHUCKS, Full Floating

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Gear

Horton, E., & Son Co., Windsor Locks, Conn.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

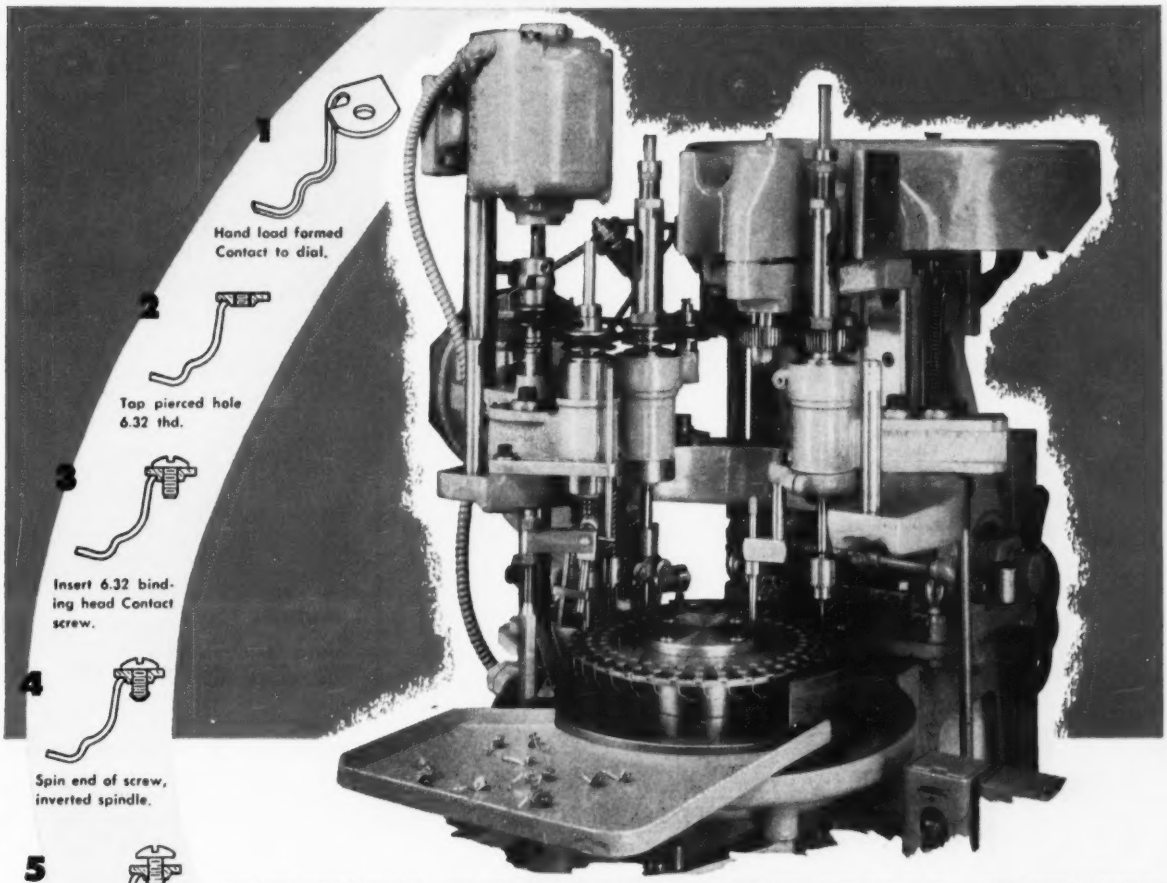
CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

(*Continued on page 346*)

(For more information on products advertised, use Inquiry Card page 245)

Bodine CASE HISTORY NO. 35



PRODUCING FLUORESCENT TUBE SOCKET CONTACTS



Bodine No. 40-10 Dial Type Tapping and Screw Inserting machine (all safety guards removed) tooled for production of Fluorescent Tube Contacts. Production rate, 60 pieces per minute.

Bodine multiple spindle automatics lead the field in high speed repetitive production of small parts. If your needs involve drilling, tapping, milling, screw inserting, staking and assembly operations . . . there's a Bodine model we can tool to handle several or all of them on one machine. Ask us for case histories showing what we have done to cut costs of accurate quantity production.

* Ejection is accomplished by contact on the backed up screw, thus giving automatic inspection for perfect work.

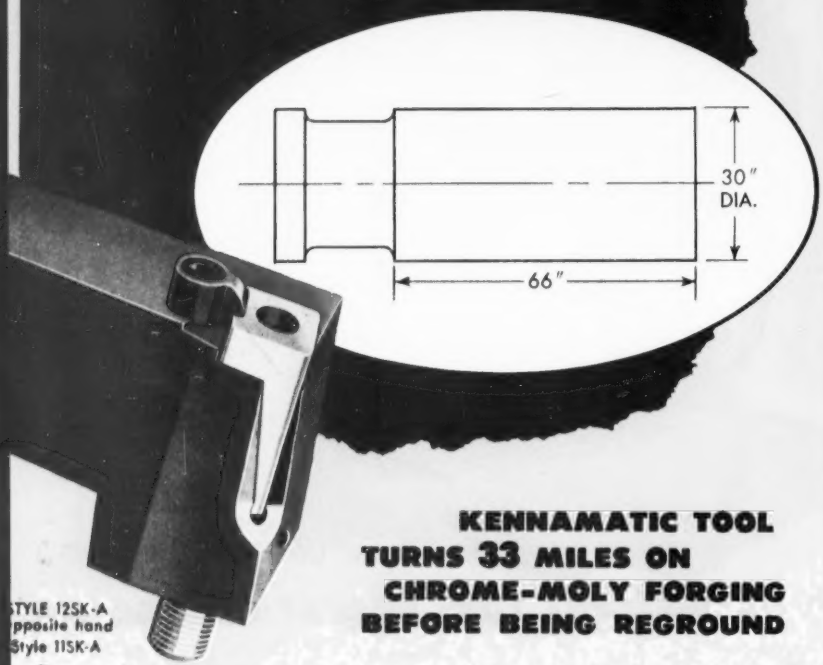
"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

28D3A

(For more information on products advertised, use Inquiry Card page 245)

Here's Marathonian MACHINING



STYLE 12SK-A
Opposite hand
Style 11SK-A

KENNAMATIC TOOL TURNS 33 MILES ON CHROME-MOLY FORGING BEFORE BEING REGROUND

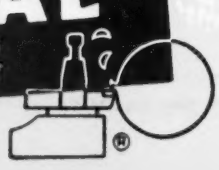
A 33 mile run before wearing out is a noteworthy record. Kennametal tools this strenuous course in stride.

To turn a 30" diameter 66" long chrome-moly steel forging—very rough and scaly—was a difficult problem. Carbide tools (not Kennametal) were unsatisfactory. HS steel tools were too slow and costly; they had to be reground after turning only 5" of the surface at 3 RPM, .093" feed, and ⅞" cut . . . 20 to 24 tool changes were required to complete one roughing cut and one finishing cut.

The problem was solved with a Heavy Duty Kennamatic tool, 1¼" square, Grade K2S insert. At a speed of 19 RPM and .020" feed, the 66"-long ⅞"-deep rough cut was made. Then the insert was indexed and finishing cut run. Utilizing the eight available cutting edges, no grinding was necessary until four forgings were completely machined. This represents *33 miles* of lineal turning, in contrast to the best HSS performance of *422 feet*.

Making short work of long turns is common with Kennametal. Ask our Tool Engineers to demonstrate. Kennametal Inc., Latrobe, Pa.

KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY



CHUCKS, Quick Change and Safety
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Sculiy-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel
Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Homestrand, Inc., Larchmont, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CLAMPING APPLIANCES FOR MACHINE TOOLS
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLAMPS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

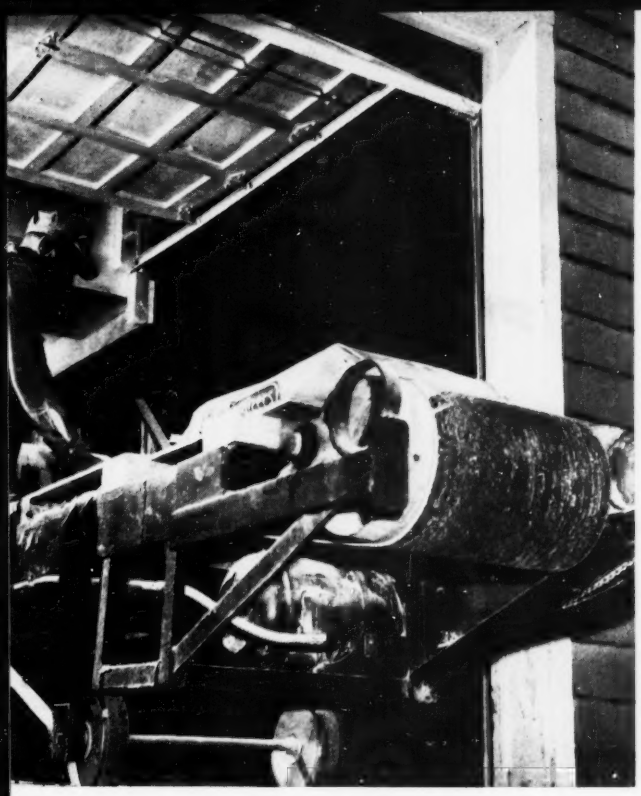
CLEANERS, Chemical, for Metal
Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd., Van Dyke, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

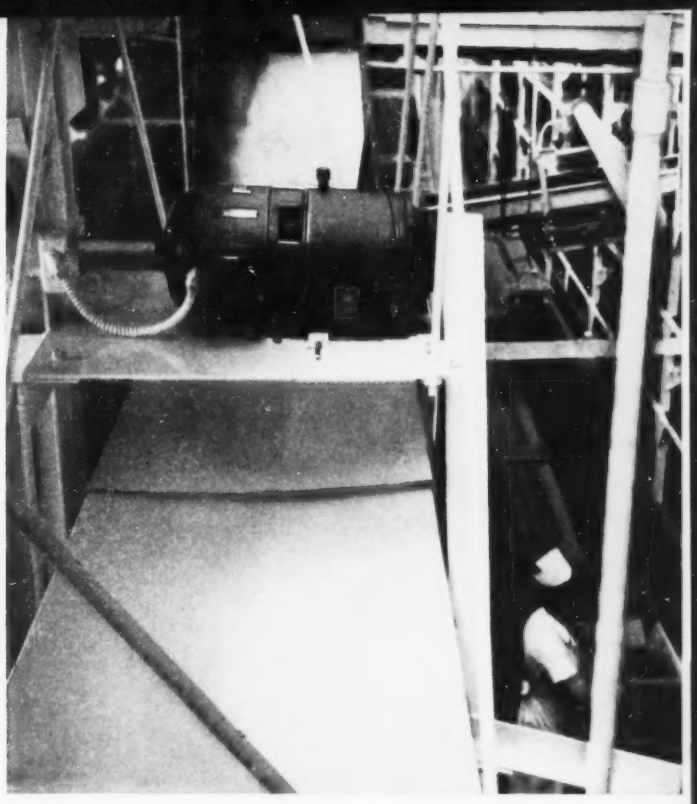
COLLARS, Safety
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS
Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

(*Continued on page* 350)



ON THE DRIVEN MACHINE. Compact, single-unit G-E Tri-Clad* Gear-motors—available in all three AGMA gear classes—are easily installed on machines such as the conveyor in this chemical plant.



UP OUT OF THE WAY is where this eastern bakery installed a G-E Gear-motor on its cooling conveyor. Gear-motor operates 56 hours per week—no maintenance has been required since installation.

You can install G-E Gear-motors anywhere

. . . on or under the floor, on the ceiling, the wall, or even outdoors in the weather. Installation is no problem with G-E Tri-Clad Gear-motors . . . there are no bulky external couplings, chains, or belts between the motor and the speed-reduction unit. G-E Tri-Clad Gear-motors are packaged, single units . . . complete in themselves . . . as easily and as quickly installed as any constant-speed motor of the same rating.

G-E GEAR-MOTORS SAVE YOU SPACE. Their compact, well-balanced design frees valuable floor space for productive purposes.

G-E GEAR-MOTORS ARE ECONOMICAL. Initial costs are often lower than either a low-speed motor or the combination of a normal speed motor and a separate speed reducer. High efficiency up to 98.5% minimizes operating expenses.

Assure your application of the most compact and economical low-speed drive . . . one which can be installed anywhere. Order your G-E Tri-Clad Gear-motor through your nearest G-E Apparatus Sales Office or your Authorized G-E Agent or Distributor. For more information write to Section 755-13, General Electric Co., Schenectady 5, N. Y. for your free copy of Bulletin GEA-1437H.

*Reg. Trademark of General Electric Company.

You can put your confidence in—

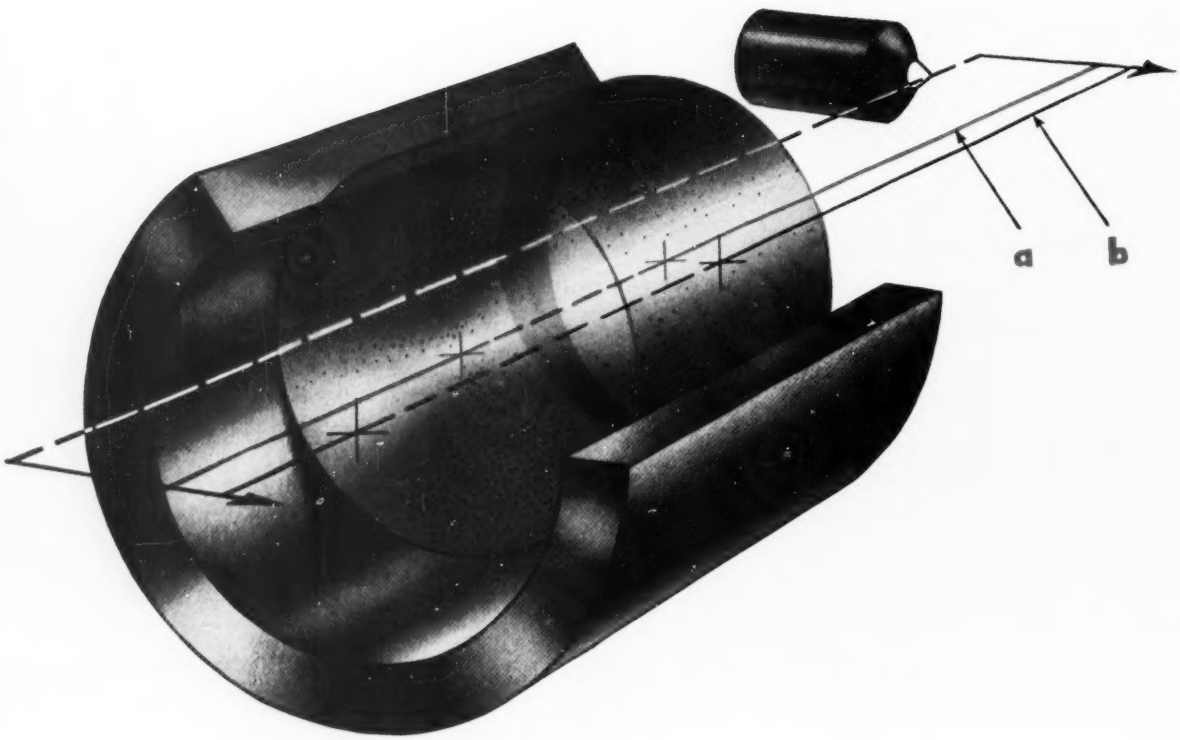
GENERAL ELECTRIC

OUTDOORS IN THE WEATHER. This 5-hp totally enclosed G-E Tri-Clad Gear-motor—exposed to all weather conditions—drives a sand screening operation in a carbon and graphite products plant.



alignment

for better internal grinding

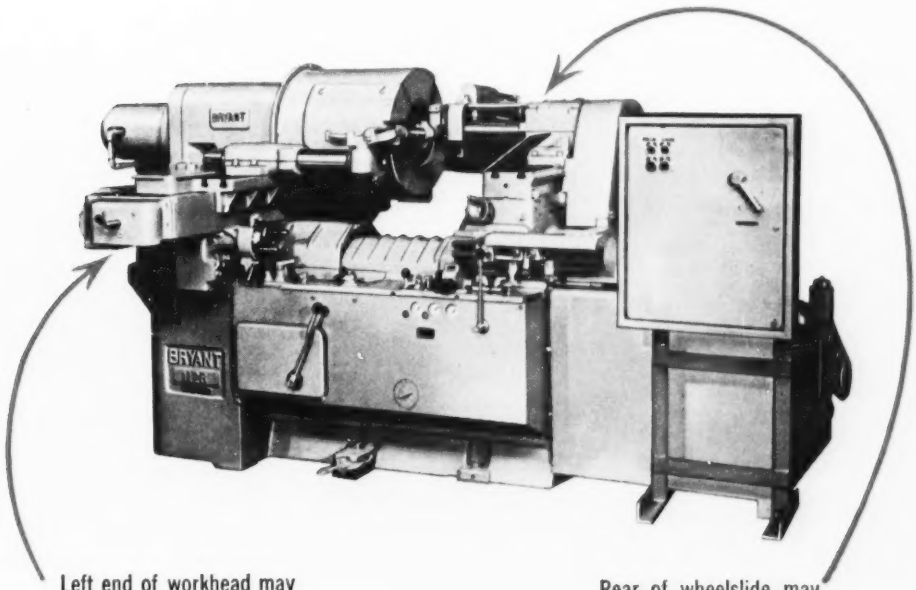


THE heart of the internal grinding process is the line of contact between the wheel and the work. This contact line must be straight for the full length of the wheel and the full length of work as the wheel traverses. If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.

Several elements contribute to the straightness of this line of contact: first, the path along which the wheel is traversed "a" must be a straight line; second, the axis of the wheel must lie in a plane parallel to the wheel path "a", and third, the axis of the work "b" must be parallel to the wheel

path "a". For production grinding, the diamond must lie in the plane established by the wheel axis and the work axis.

Perfect alignment means that the slides must be straight and true, the wheel and work spindles must be in line and "zeroed" for center heights and the diamond must be on "dead center" of the wheel. A full, straight line of contact will extend wheel life, improve wheel action, and will assure correct geometry and required finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This heavy-duty, semiautomatic machine, with hydraulic controls, has a 26″ swing and will grind holes with a maximum depth of 12″. Although designed for large, heavy work, a selection of wheelheads is available to grind holes as small as 1″ in diameter. The extremely rugged bed provides the strength and rigidity necessary for vibrationless operation. The workhead has two positions, one for grinding and a forward position for ease in loading and checking large work. The wheelhead is adjustable to grind work up to 15° included angle. The Bryant workhead and wheelhead slides are anti-friction to provide extremely accurate grinding and sensitive control.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Boring Machines

SPECIALLY ENGINEERED for today's high-speed finishing methods



If you want to take full advantage of the new laminated phenolic grinding wheels and discs . . . and of the most recently developed cleaners and polishes — these modern-as-tomorrow Millers Falls tools are made for you.

They're compact, rugged, beautifully balanced. In every detail, they're engineered to give the performance characteristics needed to make the most of the latest finishing methods.

The models shown here are just part of Millers Falls broad line of high-performance electric tools for production and maintenance. Each is designed and built to save time and produce better work for you at lower cost. Write for full information, or, let us arrange a convincing demonstration.

LIGHT, HIGH-POWERED

New No. 870 Sander

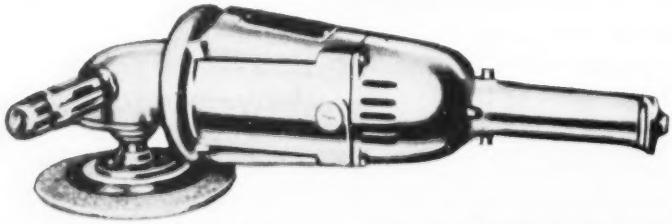
Weighing only 7½ lbs. — yet with a full 5.5 ampere rating and designed for continuous production use — this beautifully engineered 7" sander sets new standards in its field. No load speed is 4500 r.p.m., making the No. 870 perfect for use with the new laminated phenolic wheels and discs. In every way, an outstanding performer for fast sanding, wire brushing, grinding and polishing.

FASTER — MORE POWERFUL—

New No. 270 Polisher

Greater power (5 amperes) and a higher speed (1900 r.p.m.) make this newly designed 7" unit ideal for use with the latest-type cleaners and polishes which have recently found such favor. Light and compact, it handles beautifully and gets at the less accessible surfaces. It's supplied with a deep carpet-pile wool pad, the most effective polishing head ever developed. The No. 270 is also highly efficient for rubbing, sanding and grinding.





FOR HEAVY SERVICE—

No. 900 Sander

With 8.0 ampere rating, this powerful 7" sander has long been a favorite in hundreds of shops. Regularly equipped with flexible rubber and Co-ro-lite pads for sanding, it also offers exceptional, smooth-running performance with cup grinding wheels and wire cup brushes for a wide variety of finishing operations.

MILLERS FALLS TOOLS
SINCE 1868
The Mark of Superiority

MILLERS FALLS COMPANY • GREENFIELD, MASS.

Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York,

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Loaning).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

COMPOUNDS, Resin and Molding

Bakelite Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CONTROLS, THERMO

Control Products, Inc., 306 Sussex St., Harrison, N. J.

(*Continued on page* 354)

(For more information on products advertised, use Inquiry Card page 245)

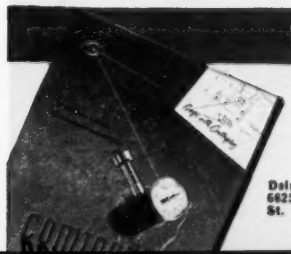
"PACKAGED PRECISION"



COMTORPLUG

FOR GAGING HIGH-PRECISION HOLES

REQUEST NEW BULLETIN NO. 46



COMTOR CO. 74 FARWELL ST., WALTHAM 54, MASS.

Barwood & Company, 3137 North 15th St., Philadelphia 32, Pa.
Gerald B. Duff & Co., 68 Clinton Ave., Newark 5, N. J.
Francis D. Huntington, 9101 East Jefferson Ave., Detroit 14, Michigan
Proctor & Martin Co., Inc., 297 Franklin Street, Boston, Mass.
Harold E. Sundberg, Ellicott Square, Buffalo 3, New York
Conant Tool & Engineering Co., 347 West 107th Street, Chicago 28, Illinois
Dolph Boettler, 6625 Delmar Blvd., St. Louis 5, Missouri
Louis A. Gain, 1544 Spruce St., Berkeley, California
L. D. Supply Co., 214 East 10th St., Tulsa, Oklahoma
M. L. Levis, Fairview Park, 4594 West 214th St., Cleveland 26, Ohio
Walter R. Ott, 305 Abingdon Rd., Dayton 9, Ohio
Severance Tools of Canada, 60 Front Street West, Toronto, Ontario, Canada
Gerhart M. Cooke, 4760 East Olympic Blvd., Los Angeles 22, California

SCULLY JONES Precision Holding helps

Speeds tool changes...safeguards accuracy and production on 16-Station Automatic Transfer Machine

When you watch V-8 cylinder blocks undergoing 379 precision operations on a battery of three Greenlee Transfer Machines . . . 80 blocks per hour, with unbelievable automaticity . . . you realize the important contribution made by Scully-Jones "Precision Holding" on the business end of Greenlee spindles. To keep production flowing, tool changes are simple and fast, critical adjustments between spindle and work are accurately maintained.

Greenlee engineers chose Scully-Jones Drill and Tap Chucks to provide a positive, accurate drive for the cutting tools on this 16-station unit illustrated. Easy to insert and eject from the spindles, they save costly setup time. Ground concentric from Mar-tempered steel, they eliminate hole distortion, last indefinitely without losing accuracy.

Scully-Jones Quick-Lock Adapters and Spindle Extension Assemblies provide individual, fine adjustments for each spindle, maintain accurate depth of cut after tool sharpening. There's no guesswork, no waste time or effort because these precision tools do not bind or jam.

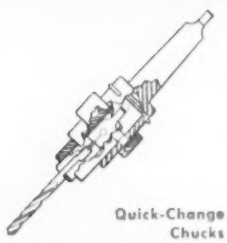
No matter what your tool holding or driving problem may be, Scully-Jones "Precision Holding" will give you a better, more accurate job! See your Scully-Jones representative or stocking distributor for quick service.



STYLE "B" DRILL CHUCKS for straight shank drills, reamers, and similar tools, save tool life, work to close centers, speed tool changes, give guaranteed accuracy, resist nicking and burring over a lifetime of hard service. Complete stocks available.

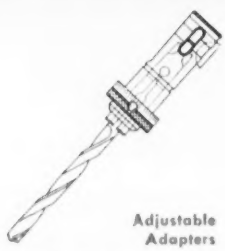
STYLE "A" TAP CHUCKS eliminate bell-mouthed and oversized tapped holes, save costly setup and downtime, work to close centers, last indefinitely under heavy stresses and loads. Complete stocks available.

THERE'S A SCULLY-JONES PRECISION TOOL FOR EVERY HOLDING OR DRIVING NEED



Quick-Change Chucks

Change tools in "seconds" without stopping spindle. Speed production. Hold collet firmly, give positive drive.



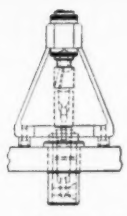
Adjustable Adapters

Permit accurate adjustments in cluster of spindles. End guesswork on fine adjustments. Speed tool changes.



Tension and Compression Tap Holders

Prevent tap and spindle damage by compensating for variations of feed between spindle and tap.



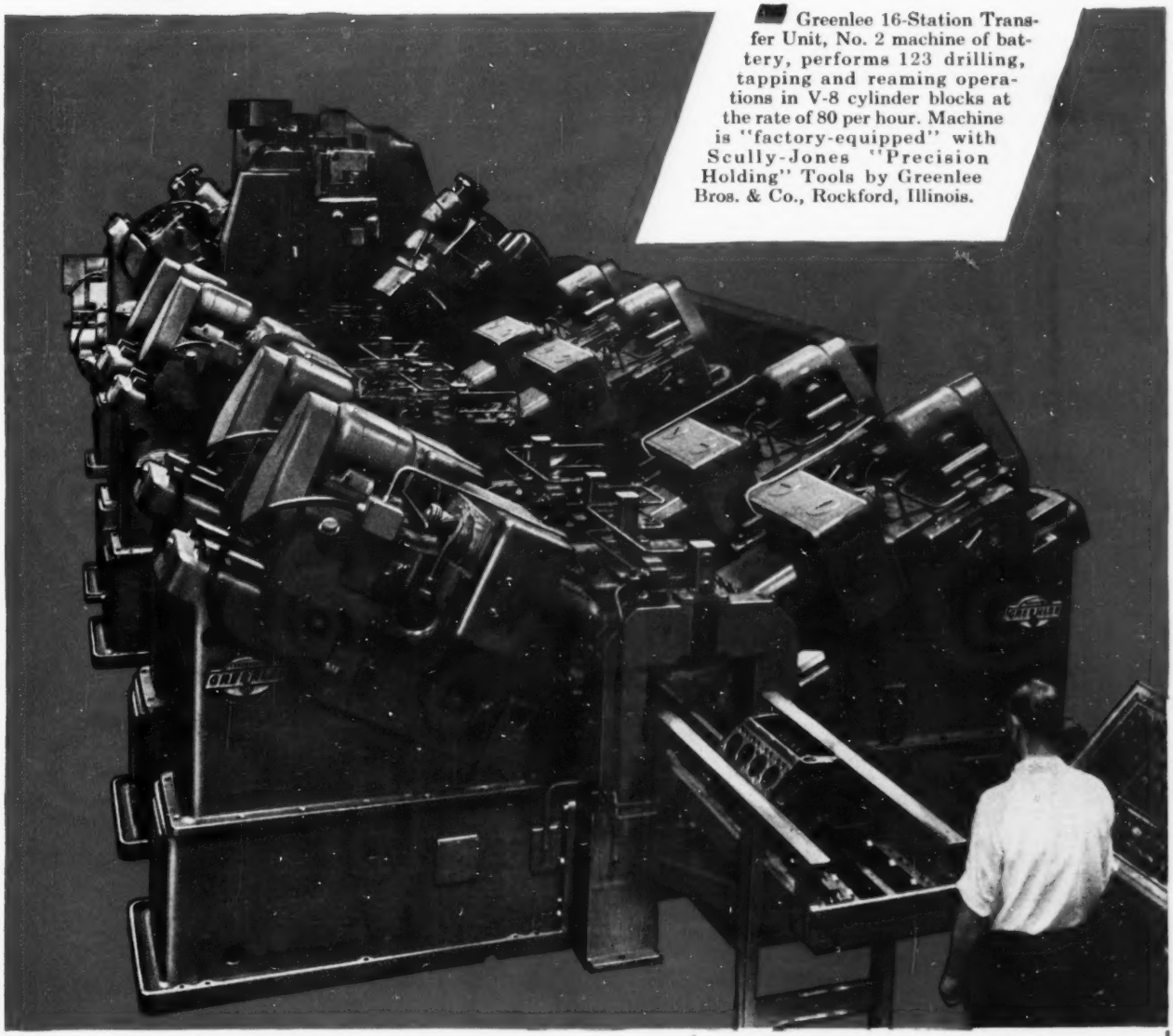
Presetting Gauges

Standard height and flush pin gauges reduce setup time 50% or more on multiple spindle machines.

PRODUCTION-MACHINERY

GREENLEE

"robotize" production!



Greenlee 16-Station Transfer Unit, No. 2 machine of battery, performs 123 drilling, tapping and reaming operations in V-8 cylinder blocks at the rate of 80 per hour. Machine is "factory-equipped" with Scully-Jones "Precision Holding" Tools by Greenlee Bros. & Co., Rockford, Illinois.

SCULLY JONES

Precision Holding

FOR HOLDING PRECISION

Scully-Jones and Company, 1906 South Rockwell Street, Chicago 8, Illinois

MORE FACTS—Send for free catalog describing Scully-Jones "Precision Holding" Tools. Paste coupon to letterhead or post card and mail today.

Gentlemen: I'm interested in learning more about Scully-Jones Tools.

☐ Please send Bulletin No. 1-50 describing Drill and Tap Chucks.

☐ Send catalog on your complete line.

Name_____

Company_____

Address_____

City_____ State_____

(For more information on products advertised, use Inquiry Card page 245)

• TOOL ROOM SAVINGS and
• PRECISION PERFECTION *ASSURED*

with OLIVER ACE

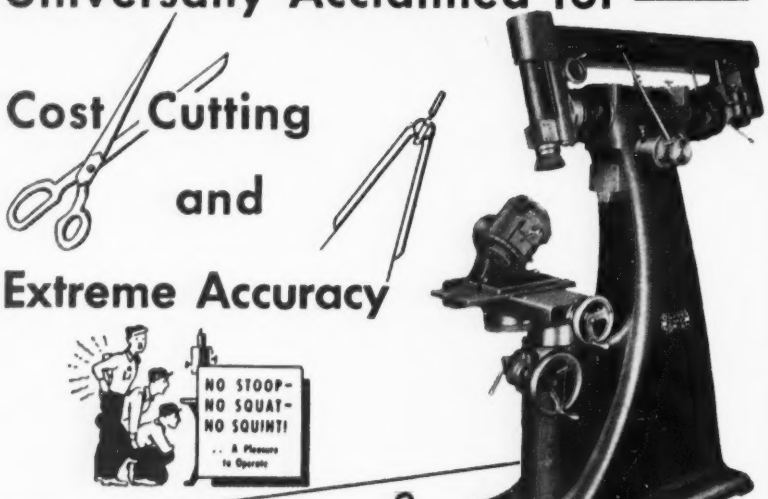
Universal Tool and Cutter Grinders

Universally Acclaimed for —

Cost Cutting

and

Extreme Accuracy



Oliver Ace Tool and Cutter Grinders make difficult jobs easy and economical . . . keep the most difficult cutters sharp. Check these Oliver Ace-High points of superiority:

1. Direct reading for clearance reduces operator's fatigue . . No Stoop, No Squat, No Squint. Requires no computation.
2. Assures highest degree of accuracy
3. Built to give long-lasting service.
4. Handles wide range of cutter grinding.
5. Excels on high-speed and Tungsten-Carbide work.
6. Dependable at all times.
7. Requires fewer attachments than ordinary cutter grinders.
8. Is faster on most grinding operations.
9. Simple setup.
10. Easy operation.

See our Catalog in Sweet's Directory

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular saws.

2 MODELS: Standard and Heavy Duty (illustrated)
Write Today for Complete Data

OLIVER INSTRUMENT CO.
1410 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

COOLANT SEPARATORS

See Separators, Oil or Coolant.

COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Peck, Stow & Wilcox Co., Southington, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13 Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S. Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
James D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

(*Continued on page* 356)

(For more information on products advertised, use Inquiry Card page 245)

One hour

1800 lbs.-rough



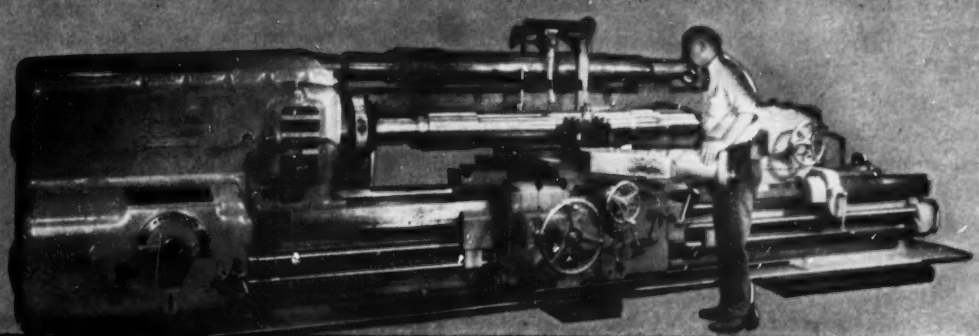
1300 lbs.-finished

One hour to finish turn this Diesel Locomotive Driving Axle from the rough forging, removing 500 pounds of chips and using 60 horse power cuts in the process.

This shows what a 25" "AMERICAN" Hydraulic Duplicating Lathe driven by a 50 H.P. motor can do. Production records of this kind are the rule rather than the exception and are being made daily.

"AMERICAN" Hydraulic Duplicating Lathes reduce machining time 50 to 75 per cent . . . cut costs to the bone . . . pay good dividends on the investment.

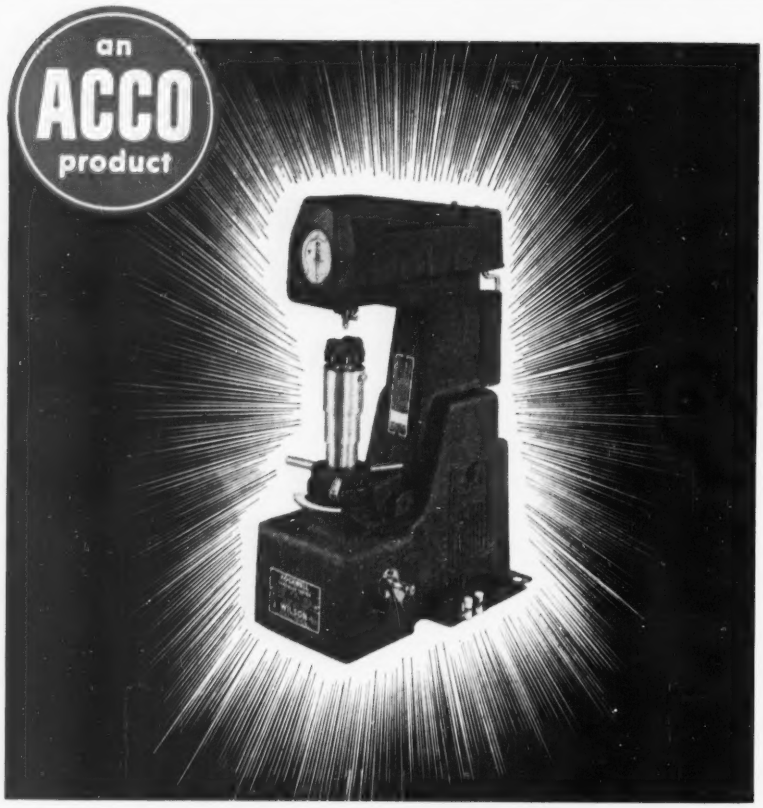
Repeat customers vouch for this in the most convincing way.



Bulletin No. 35 gives a complete description and shows many examples. It's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills



WILSON "ROCKWELL"*...
the Jewel of Hardness Testers

• Always the leader . . . recognized and respected. Its quality has been imitated, but never attained. The WILSON "ROCKWELL" sets itself apart—stands alone—as the jewel of Hardness Testers. WILSON accepts the responsibility of leadership.

The many models of WILSON "ROCKWELL" for normal and superficial hardness testing offer the utmost in production as well as laboratory work. The various models of WILSON TUKON micro and macro hardness testers cover the entire range of scientific uses. Standards set by WILSON "ROCKWELL" and TUKON testers are accepted everywhere.

Be sure. Look to WILSON for the hardness testers you need. Don't be satisfied with anything less than a genuine "ROCKWELL." It may cost less than you think.

See them in action at National Metal Exposition
Cleveland • Oct. 19 to 23
Booth 1716

ACCO

*Trade Mark Registered

WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

230-D Park Avenue, New York 17, N. Y.

WILSON "ROCKWELL" and TUKON Hardness Testers

Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Southwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429 Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32 Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.

(*Continued on page* 358)

(For more information on products advertised, use Inquiry Card page 245)



Don't *tell* him, Mr. Anderson . . . . . *show* him!

That new man in the shop, Mr. Anderson, will ask a lot of questions about taps and tapping results. But we know, and you know, that *showing* not *telling*, is the proof of "*performance-ability.*" Show him what Hanson-Whitney taps are doing . . . point out their complete dependability in day-in, day-out production. Then, like you, he'll be sold on . . .

Hanson-Whitney.....

The Hanson Process is the original method of *finishing after hardening*. Through this process, Hanson-Whitney has for 34 years produced a quality line of finished precision taps to the complete satisfaction of our customers. We have *never* manufactured cut thread or unfinished taps in our years of serving the metalworking industry.

Yes, Mr. Anderson, the proven performance of Hanson-Whitney taps is a matter of record. Naturally, the right tap for the specific job is essential . . . ask the Hanson-Whitney representative for recommendations.

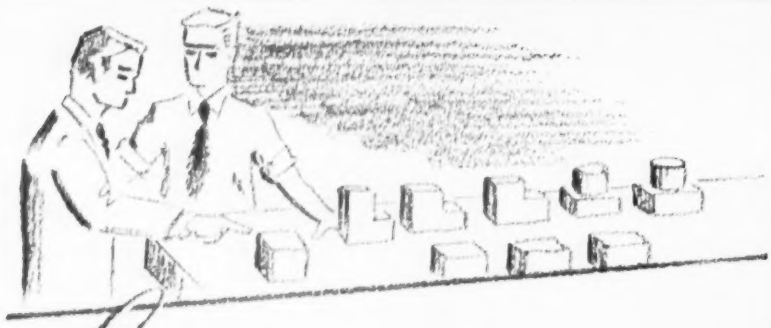
HANSON-WHITNEY DIVISION of the WHITNEY CHAIN CO.
160 Bartholomew Avenue, Hartford, Connecticut, U. S. A.

the **HANSON**
Threading Processes
Offer Complete
Coordinated
Responsibility
for
The Machine Tools
The Cutting Tools
The Measuring Gages

Our "Mr. Anderson" is a composite character typical of the thousands of experienced practical machinists throughout the country. You, too, have a Mr. Anderson in your shop...ask him what he thinks about Hanson-Whitney products.

6HW53A

(For more information on products advertised, use Inquiry Card page 245)



Cut **PRODUCTION COSTS with the** *right* **plant layout**

Many of our clients are amazed by the cost savings realized when we "revamp" their plant layouts. This entails the rearrangement in equipment, the elimination of unnecessary handling operations, and the complete reorganization and integration of their "production flow".

The right kind of plant layout stems from an objective approach toward every phase of production. It helps to iron out all the production "kinks", reduce inventories, lower handling time, eliminate back-tracking, and assist in production control.

Pioneer has developed a thorough system of procedure in transferring the poor plant layout into one that reaps cost savings far beyond anything anticipated by the client. This procedure entails the preparation of process flow charts, taking into consideration such factors as methods, material handling, temporary and permanent storage, and inspection of materials. The flow chart is then transferred into a set of templets . . . or scale models . . . which is developed into a plant layout, allowing us to analyze the client's production from all angles.

We'll be glad to help show you how to cut production costs . . . with the right plant layout . . . tailored to meet your specific production needs! Send today for Bulletin 162-G on "How to Harness Your Production".

Pioneer ENGINEERING & MANUFACTURING CO., INC.

19643 John R St., Detroit 3, Mich.

Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
OK Tool Co., Milford, N. H.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Verner Hwry., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Shear-Speed Chemical Products, Div. Michigan Tool Co., 14230 Birwood Ave., Detroit 4, Mich.
Sinclair Refining Co., 630 4th Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).
Pines Engineering Co., Inc., Aurora, Ill.

CUTTING-OFF MACHINES, Abrasive Wheel

Campbell Mch. Div., American Chain & Cable, 929 Conn. Ave., Bridgeport, Conn.
Columbia Machinery & Engrg. Corp., Hamilton 1, O.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G. N. Lexington Ave., Pittsburg 8, Pa.

CUTTING-OFF MACHINES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 362)

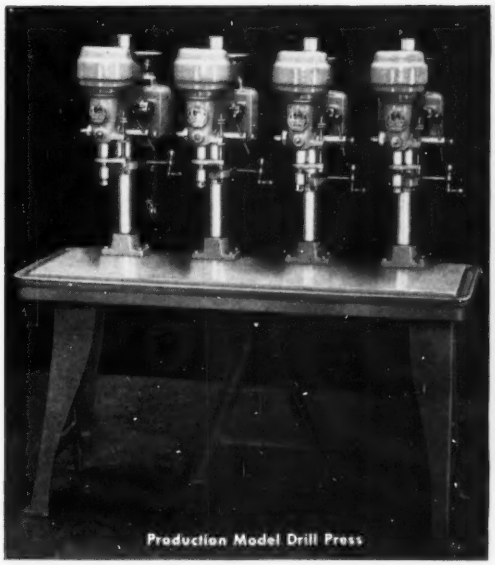
(For more information on products advertised, use Inquiry Card page 243)

SOUTH BEND

Drill Presses

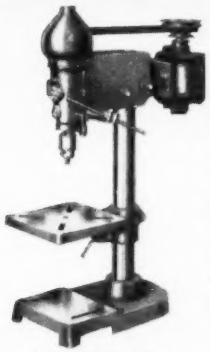


14" Precision Model Bench Drill Press



Production Model Drill Press

for Efficient Production



14" Economy Model Bench Drill Press

South Bend precision-built drill presses have many features which help reduce the cost of production machining. Their accuracy and sensitive handling make them ideal for small work requiring close tolerances. And their rugged construction assures long, dependable service on tough jobs. Built with typical South Bend quality and skill, each model is an outstanding value. Choice of Precision, Multiple-head or Economy models. Send coupon for complete information.

14" Precision Model Drill Presses—Drill to center of 14¼" circle. Maximum drill size ½" in iron or steel. Four spindle speeds, 720 to 4325 r.p.m. approx. Belt tension release lever. Spindle run-out .001" max. Spindle square to table within .002" in 5". Balanced pulleys. Built-in shielded light. Free-floating spindle with precision splines. Quill bearing tension adjustment. Four precision ball bearings. Interchangeable spindles.

• • •

14" Economy Model Drill Presses—Capacities and speeds same as above. Spindle run-out .003" max. Spindle square to table within .0075" in 5". Free-floating spindle. Six splines, spindle and drive sleeve. Quill bearing tension adjustment. Four precision ball bearings. Choice of four spindles.

• • •

Production Model Drill Presses—Available in 1, 2, 3 or 4 spindle models. Each head has independent vertical adjustment. Supplied with or without coolant equipment.



Can I get it? When? How?

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

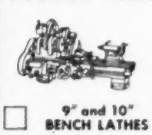
Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES



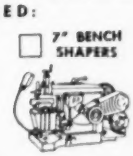
☐ 10" to 16-24" FLOOR LATHES



☐ DRILL PRESSES



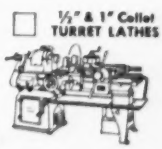
☐ 7" BENCH SHAPERS



☐ TOOL GRINDERS



☐ ½" & 1" Collet TURRET LATHES



Name_____ Company_____

Street_____ City & State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

(For more information on products advertised, use Inquiry Card page 245)

You get more parts per hour

PRODUCTION INCREASED 50%
COSTS REDUCED 11.6%

MACHINE TEST REPORT

Stock Size	-5/8" Hexagon
Part Name	-Hone End Blank
Machine	-1-1/4 RAG Acme Gridley
Machine Operations	-Forming, drilling, reaming
End Tool Slide Com	-1/2
End Tool Slide Feed	- .0065 for B-1113 - .0075 for MX

COMPARATIVE PRODUCTION

GRADE	RPM	SFM	PART TIME (SECONDS)	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	1160	221	6	600	-	-
MX	1556	290	4	900	50	50

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	420	630
Hours to make 10,000 parts	23.81	15.87
Direct Labor	$ 22.02	$ 14.68
Machine Overhead @ $2.275 per Mach./Hr.	$ 54.17	$ 36.10
Conversion Cost	$ 76.19	$ 50.78
Material Cost	$142.30	$142.30
Total Manufactured Cost of 10,000 parts	$218.49	$193.08
Saving	$ 25.41	or 11.6%

*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

PRODUCTION INCREASED 51.6%
COSTS REDUCED 17.3%

MACHINE TEST REPORT

Stock Size	-1-1/8" Rd.
Part Name	-Pulley Hub
Machine	-6 Spindle Conomatic, 1-1/4"
Machine Operations	-Rough form, finish form, drill, ream, counter-sink, spin, cut-off

COMPARATIVE PRODUCTION

GRADE	PART TIME (SECONDS)†	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	22.9	157	-	-
MX	15.1	238	51.6	51.6

†Estimated

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production Hr. at 70% Efficiency	110	167
Hours to make 10,000 parts	90.9	60.0
Direct Labor	$ 84.08	$ 55.50
Machine Overhead @ $2.275 per Mach./Hr.	$206.80	$136.50
Conversion Cost	$290.88	$192.00
Material Cost	$280.00	$280.00
Total Manufactured Cost of 10,000 parts	$570.88	$472.00
Saving	$ 98.88	or 17.3%

*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

PRODUCTION INCREASED 29%
COSTS REDUCED 8.0%

MACHINE TEST REPORT

Stock Size	-3.4" Hexagon
Part Name	-Master Cylinder Outlet
Machine	-1-1/4 RAG Acme Gridley
Machine Operations	-Forming, drilling, threading, shaving, turning, cut-off
End Tool Slide Com	-5/8
End Tool Slide Feed	- .0068 for B-1113 - .0073 for MX

COMPARATIVE PRODUCTION

GRADE	RPM	SFM†	PART TIME (SECONDS)	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	942	213	7-3.4	465	-	-
MX	1215	275	6	600	29	29

†Calculated from diameter across corners

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production Hr. at 70% Efficiency	326	420
Hours to make 10,000 parts	30.68	23.81
Direct Labor	$ 18.38	$ 22.02
Machine Overhead @ $2.275 per Mach./Hr.	$ 69.80	$ 54.17
Conversion Cost	$ 98.18	$ 76.19
Material Cost	$175.50	$175.50
Total Manufactured Cost of 10,000 parts	$273.68	$251.69
Saving	$ 21.99	or 8.0%

*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

at lower cost per part ...when you do the job with MX

today's faster-cutting screw stock

● You don't have to take our word for it. When we tell you that U·S·S Free-Machining MX will increase your production and that it will cut the cost of any part you now machine from ordinary Bessemer screw stock, we have the FACTS to back us up . . . figures that speak for themselves.

In the three years that this high speed, freer-cutting bar stock has been on the market, hundreds of shops have put it to the test. Although the more than a billion parts made with MX have been of infinite variety and have been produced under dissimilar conditions and on screw machine equipment of different types—the results obtained have been similar.

Here is what has happened in shop after shop: Output per machine, per hour, per man, has been increased. Time between tool grindings has been extended. Parts finish has been better. Close dimensional accuracy has been easier to obtain. Rejections have been fewer.

And despite its better performance, MX costs no more than ordinary screw stock. Consequently, savings with MX have been invariably recorded. These savings have averaged between 10 and 15%, but also have run as high as 42%. Can you afford to give your competition this edge on you?

Give U·S·S Free-Machining MX a thorough trial. Produced in all the popular screw stock sizes, it is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

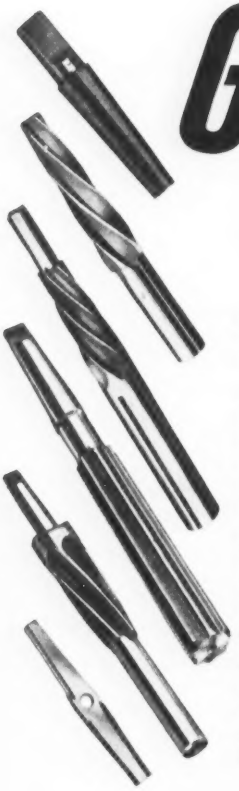
3-495

UNITED STATES STEEL



FOR SPECIAL REAMERS . . . REMEMBER

GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"



14405 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS, Air

Bellows Co., 230 W. Market St., Akron, Ohio.
Hannafin Corp., 1101 S. Kilbourn Ave., Chicago.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordance Co., Irvine, Warren County, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DEALERS, Machinery

Botwinik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Pioneer Engrg. & Mfg. C., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die.

DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

(*Continued on page 364*)

(For more information on products advertised, use Inquiry Card page 245)



LINDE'S News of Metalworking

New Machine Carriage Saves Time On Many Jobs

A new machine carriage in the low-priced field does dozens of metalworking jobs—and does them more quickly, accurately, and uniformly than the most skilled hands. This machine, the OXWELD CM-45, handles practically all machine carriage requirements in small metalworking shops, and supplements heavier equipment in larger plants, shipyards, and mills.

Used on track, the CM-45 is ideal for accurate straight-line cutting. It also cuts top or bottom bevels at practically any angle. With standard radius rods, it cuts circles with diameters of from 2 to 54 inches. To cut larger circles, a longer radius rod can easily be substituted.

Flame-treating work—be it flame-hardening, flame-softening, or low-temperature stress relieving—requires precisely controlled heat. With the CM-45 and appropriate heating apparatus, you get just that; thus you can be sure that each of your flame-treating jobs will be done uniformly.

These are only a few of the jobs that the OXWELD CM-45 Machine Carriage will do for you. Many additional cutting, welding, and heating applications will be suggested by the requirements of your own shop.

The CM-45 saves you time, not only because it does each job efficiently, but also because it is so easy to set up and operate. There is no complicated machinery to master. Its simple design makes it easy to adjust or repair. All parts are readily accessible.

Operating controls consist of a speed-control dial that can be preset or adjusted at any time, and a two-position clutch lever. All controls are grouped together at the rear of the machine for your convenience.

Since the machine weighs only 33¾ lb. complete with cutting blowpipe (as shown in Fig. 1), it's an easy, one man job to move it from one section of your shop to another. The machine's compactness also makes it convenient for use in close quarters where larger machines cannot be used.

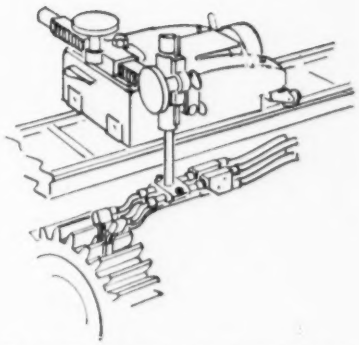


Fig. 2—Flame-treating work requires precise control of applied heat. The CM-45, with suitable apparatus, assures you of efficiency and uniformity on every job.

Any LINDE representative will gladly show you how the OXWELD CM-45 Machine Carriage will help you turn out more work in less time. Call the nearest LINDE office today for a free demonstration.

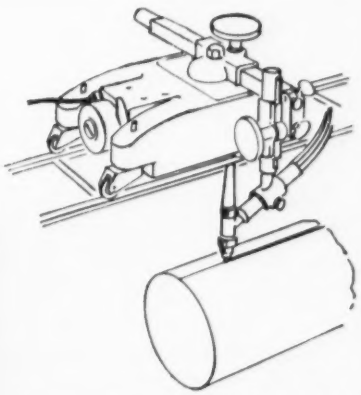


Fig. 3—Do special welding jobs, such as tube fabrication, quickly with the CM-45. Rejects are reduced to a minimum.

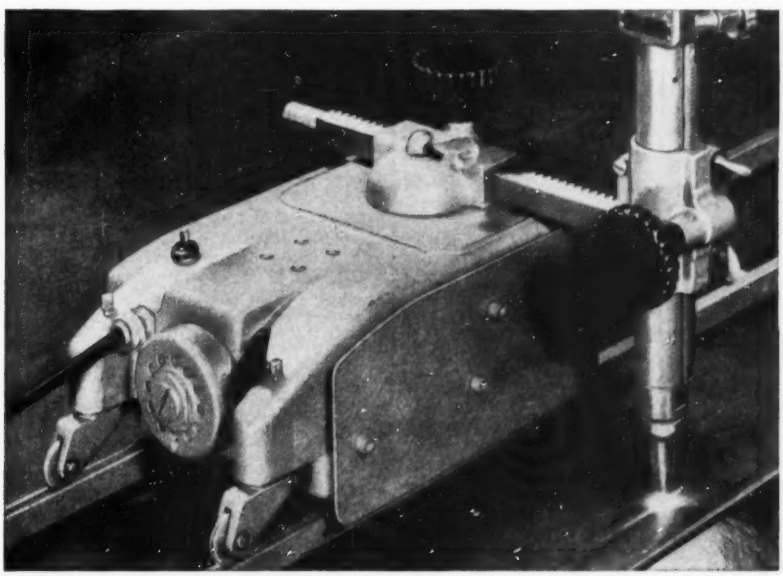


Fig. 1—Cut straight lines or bevels in plate or other steel forms. For all the CM-45's many jobs, a stepless speed range of 4 to 32 in. per min. is available.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

(For more information on products advertised, use Inquiry Card page 245)



Portable Electric Tools, Inc.

Cuts Production Costs 25% with DELTA Air Hydraulic DRILL UNITS

Portable Electric Tools, Inc., of Chicago combined two model 19-150 Delta Air-Powered Hydraulic Drill Units and a standard Delta drill press table to build a simplified, single-purpose production machine. Their aim was to increase unit production and cut operating costs.

The principal operation performed on this machine is the simultaneous boring of two brush holder holes in the PET "Super-Duty" ¼" portable drill body. Exacting accuracy is required because these holes are then used for locating the part for all other machining operations on the aluminum castings.

HERE ARE THE RESULTS:

"The Delta hydraulic drill unit has given us more than 25% production savings," says Walter Sundberg, Superintendent of Production Machining.

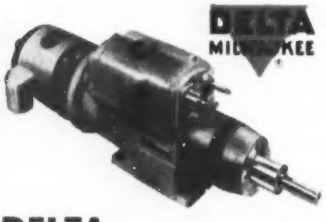
Tolerances held are plus .0005 and minus .0000.

Average output per hour, 150 bodies. No mechanical, service or maintenance problems, even when the machine has run three shifts for long periods.

Women workers with no previous experience operate the machine.

WHAT'S YOUR SPECIAL PROBLEM?

Delta air-powered hydraulic drill units can do for you what they've done for Portable Electric Tools, Inc. Your authorized Delta drill unit dealer will show you how to cut costs with this low-priced, high accuracy, high production drill unit. Our Catalog suggests many applications. Use the coupon.



DELTA MILWAUKEE

DELTA QUALITY MAKES THE DIFFERENCE

DELTA Quality Power Tools

Another Product of **Rockwell**

Delta Power Tool Division
ROCKWELL MANUFACTURING COMPANY
614K N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me catalog AD-723

☐ Send name of nearest authorized Delta drill unit dealer.

Name .....

Position .....

Company .....

Address .....

City .....Zone.....State.....

DIE CUSHIONS

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Mch. Corp., 6499 W 65th St., Chicago, Ill.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Grob Bros., Grafton, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
New England Mch. & Tl. Co., (Electronic) Berlin, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Mich.

DIE SETS, Standard

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp. 2895A W. Grand Blvd., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

DIES, Lettering and Embossing

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

DIES, Sheet Metal, Etc.

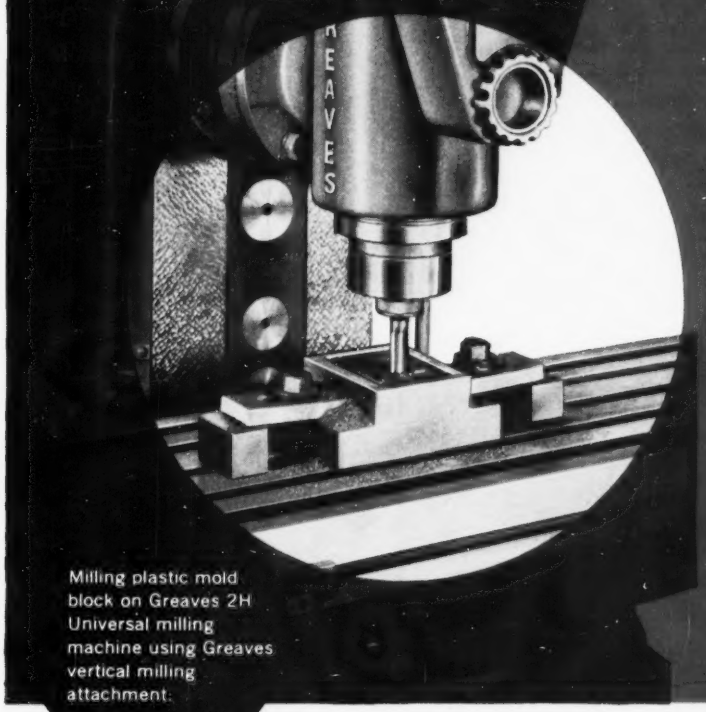
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Mullins Manufacturing Corp., Salem, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.

(*Continued on page* 366)

(For more information on products advertised, use Inquiry Card page 245)

GREAVES

the BIGGEST VALUE in milling machines today!



Milling plastic mold block on Greaves 2H Universal milling machine using Greaves vertical milling attachment.



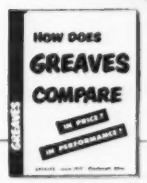
Greaves 2H Plain Milling Machine

Greaves gives top milling machine performance at bottom dollar costs

Greaves' wide speed and feed range, great power and substantial weight give it the capacity and performance usually found only in higher priced milling machines. The 2H has 18 spindle speeds from 25 to 1250 rpm, is powered by a 5-hp motor and weighs approximately 4,000 lbs (net weight plain model). Handles heavy duty production jobs as well as light milling in bronze and aluminum where the higher speeds and feeds are required.

Plain and universal models now equipped for climb milling. 18 feeds (½" to 30" per minute), hardened lapped alloy steel gears, Timken bearings, No. 50 National standard spindle nose, oil pump lubrication.

Send today for new chart showing how Greaves compares with other leading milling machines . . . how it can save money for you. Use coupon at right.



GREAVES MACHINE TOOL CO.
2500 Eastern Avenue
Cincinnati 2, Ohio

Please send me chart comparing the 8 leading U. S. milling machines for price, capacity, power and other significant specifications.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

GREAVES MACHINE TOOL CO.
CINCINNATI 2, OHIO, U. S. A.
Established 1917 Division J. A. Fay & Egan Co.

(For more information on products advertised, use Inquiry Card page 245)



the smith had the right idea

When it comes to forming metals, there's no substitute for the hammer. No other method gives metal equal toughness and resiliency.

The Torrington Swager operates on the same principle—delivering 4000 hammer blows a minute. It reduces, tapers and points rod, wire and tubing accurately and economically . . . using every ounce of stock.



Our booklet, "The Torrington Swaging Machine," gives full details on swaging and our complete line of machines. A free copy is yours for the asking.

THE TORRINGTON COMPANY
Swager Department
558 Field Street • Torrington, Conn.
Makers of
TORRINGTON NEEDLE BEARINGS

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Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Waltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasives

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DIVIDING HEADS

See Indexing and Spacing Equipment.

DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

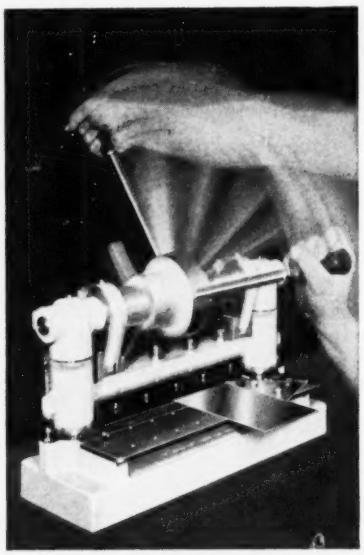
DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F., Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

(*Continued on page 368*)



Want PRECISION SHEARING at HIGH SPEED?



Check these features and you'll want a DI-ACRO* SHEAR

- **PRECISION** — strips less than .025" wide accurately sheared. Thousands of parts exactly duplicated.
- **CUTTING SPEED**—rivals that of power machines.
- **RATED CAPACITY**—16 gauge.
- **EASY TO OPERATE**—a woman can operate it.
- **CHOICE OF MODELS**—available in four sizes. Widths from 6 to 24 inches. Four power models also available.
- **ENGINEERING SERVICE**—always at your disposal.
- **PORTABLE**—readily moved.
- **RUGGEDLY BUILT**—backed by one year warranty.
- **DELIVERY**—immediate on most models.
- **COST**—that's good too.

*pronounced Die-ack-ro

LIKE MORE INFORMATION?



Send for 32-page catalog

Gives full details on both hand and power operated Di-Acro Shears, Benders, Brakes, Notchers, Punch Presses, Rod Parters and Rollers. Mail your request today.

Creators of
"DIE-LESS DUCATING"

O'NEIL-IRWIN MFG. CO.
332 8th AVE.
LAKE CITY, MINN.

di-acro PRECISION METALWORKING MACHINES

(For more information on products advertised, use Inquiry Card page 245)

Cuts them by the Dozen!

...AT A FASTER RATE

...FOR A LONGER TIME

...WITH LESS POWER



. . . . . High speed steel, shockproof segments curl the chips out of the cut for cooler, smoother, faster cutting. Replaceable tooth segments provide an economical method of substituting worn-out teeth. Segmental cold saws are just one type in the complete Atkins line of metal cutting saws.

WHATEVER YOU SAW, THERE'S AN ATKINS SAW THAT DOES IT BETTER!

ATKINS Silver Steel SAWS

ATKINS

ATKINS SAW DIVISION
BORG-WARNER CORPORATION
INDIANAPOLIS 9, INDIANA

ENGINEERING B-W INDUCTION

(For more information on products advertised, use Inquiry Card page 245)



. . . why REID GRINDERS are the easiest to operate!

. . . Turn a good man loose with a Reid precision grinder for five minutes. The first thing he'll tell you is that a Reid grinder is the *easiest* to operate. Ask him why, and he'll point out these features:



. . . A competent operator knows a competent machine when he sees—and operates one. Reid's 50 years of experience in building grinders produce a *co-ordinated* design for greater efficiency of precise operation. That's why REID is the operator's preference throughout industry.

Write for latest illustrated bulletin (618-2) with specifications of power and hand feed Reid Precision Surface grinders.

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

DRIFTS, Drill

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bellows Co., 230 W. Market St., Akron, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Keller Tool Co., Grand Haven, Mich.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL POINT SHARPENERS, Hand.

Up-To-Date Tool Co., P. O. Box Sta. A., Worcester 8, Mass.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Thor Power Tool Co., Aurora, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLING MACHINES, Automatic

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.

(*Continued on page* 370)

(For more information on products advertised, use Inquiry Card page 245)

Here's the tapping combination you asked for!



Ettco-Emrick

"UNIT ENGINEERED" 72A TAPPING MACHINE

With this Ettco-Emrick tapping combination—a rigid, sensitive tapping machine—a built-for-the-purpose tapping head—and a custom-built work holder—you can do any tapping job faster, easier and more economically. Its low initial cost and accurate, high-speed work make it a worthwhile investment for any shop, whether for tapping a single hole or thirty holes.

Your local Ettco-Emrick distributor will be glad to give you full information on the amazingly versatile 72A tapping combination. He's in a position to give you sound, expert advice on the best set-up for your needs. Call him in today. If you'd like literature

WRITE FOR BULLETIN 72A

It contains a wealth of information and data on how to use the 72A Tapping Unit to solve specific tapping problems. It's yours for the asking.



Ettco-Emrick

ETTCO TOOL CO., INC.

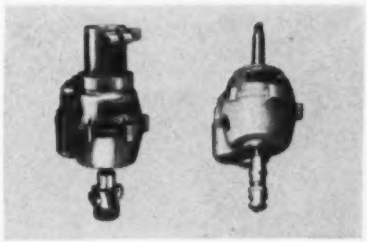
592 Johnson Ave., Brooklyn 37, N. Y.

DETROIT • CHICAGO • WORCESTER • SAN GABRIEL, CALIF.

Dealers throughout the United States and Canada

DRILLING and TAPPING EQUIPMENT NEWS

Tool Up Any Drill Press For Fast, Accurate Tapping



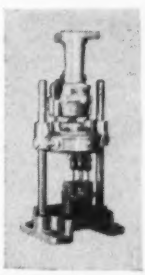
Ettco-Emrick tapping attachments can be mounted on any drill press. Newly patented friction clutch provides the delicate sensitivity needed for high speed tapping or threading. 7 different models for No. 6 to ⅝" dies and for No. 0 to 1" taps. *Details in Bulletin No. 22. Write Ettco Tool Co., 592 Johnson Ave., Brooklyn 37, N. Y.*

Balanced Tap Chuck Insures Greater Accuracy



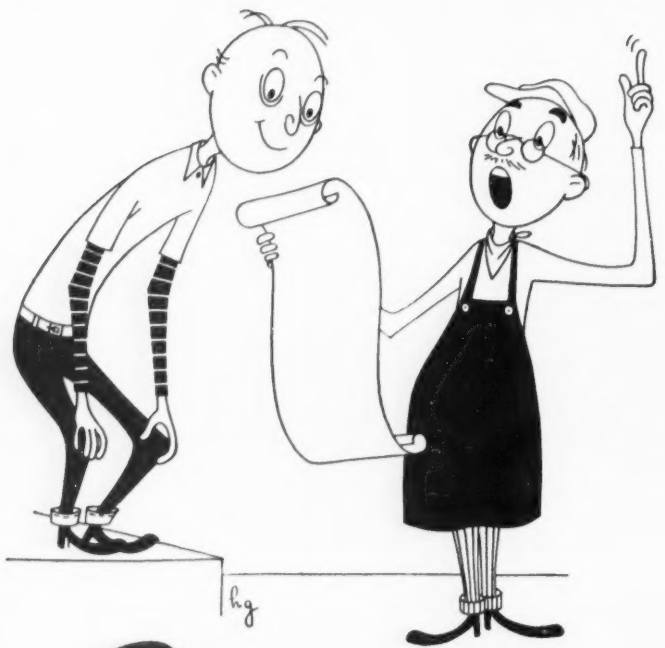
Balanced construction of this newly designed precision-made Ettco-Emrick tap chuck eliminates "whipping" action and insures greater accuracy. Light weight and small external dimensions minimize spindle inertia on reversing, making it suitable for either light, sensitive work or heavy duty jobs. Sizes available with capacities ranging from No. 0 to 1" taps. *For details, write Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn 37, N. Y.*

Multiple Tapping and Drilling Heads Offer Big Savings



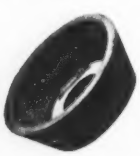
With Ettco-Emrick "Unit-Engineered" Multiple Heads, it is possible to tap or drill from 8 to 30 holes at one stroke on any drill press. Heads and work holders are engineered as a unit to meet shape and hole pattern of part being tapped and to insure fastest handling and tapping. Standardized stock parts keep initial costs low and allow heads to be converted from tapping to drilling or back again in a matter of minutes. *Details in Bulletin No. 3. Write Ettco Tool Co., 592 Johnson Ave., Bklyn. 37, N. Y.*

GRINDING PRODUCTION up 25% says the record!









SIMONDS ABRASIVE CO.

Grinding Wheels

It's an *actual* record. The job? Grinding face and sides of chilled iron clutch sleeves. The wheel? A Simonds 24" x 2" x 12" grinding wheel . . . part of Simonds Abrasive Company's complete line of quality controlled abrasive products, including grinding wheels, mounted wheels and points, segments and abrasive grain. They're described in our free data book along with recommendations for all your jobs . . . snagging, finishing, cutting off, sharpening or polishing. For prompt supply see your Simonds distributor. He's ready to serve you, eager to aid you.

Write for free data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

DRILLING MACHINES, Deep Hole

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Bellows Co., 230 W. Market St., Akron, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.

DRILLING MACHINES, Gang

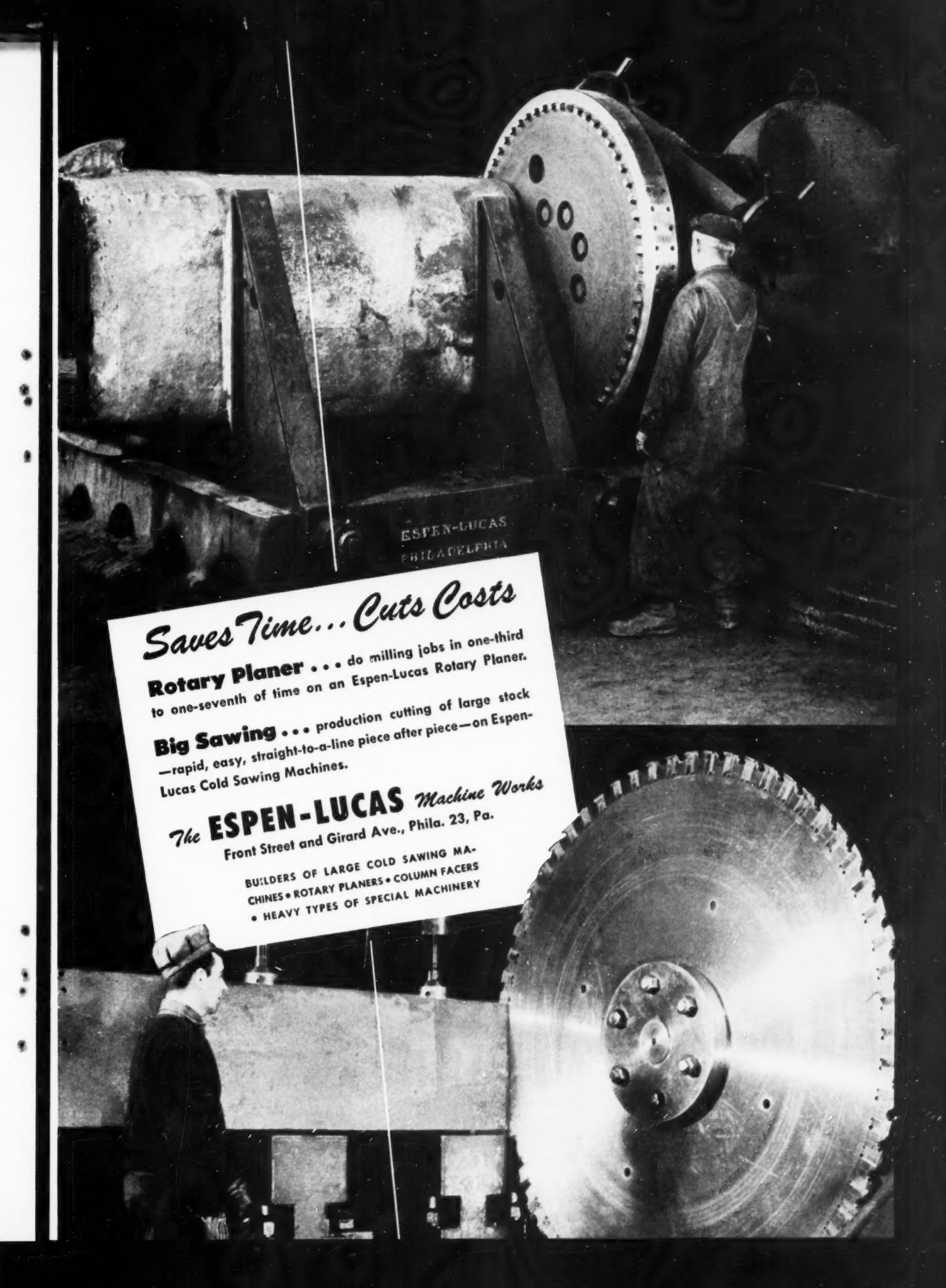
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K. Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

DRILLING MACHINES, Horizontal Duplex

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.

(*Continued on page* 372)

(For more information on products advertised, use Inquiry Card page 245)



Saves Time... Cuts Costs

Rotary Planer . . . do milling jobs in one-third to one-seventh of time on an Espen-Lucas Rotary Planer.

Big Sawing . . . production cutting of large stock —rapid, easy, straight-to-a-line piece after piece—on Espen-Lucas Cold Sawing Machines.

The **ESPEN-LUCAS** *Machine Works*

Front Street and Girard Ave., Phila. 23, Pa.

BUILDERS OF LARGE COLD SAWING MACHINES • ROTARY PLANERS • COLUMN FACERS • HEAVY TYPES OF SPECIAL MACHINERY

VINCO helped take the "guess" out of involute spline manufacturing and gaging for INTERNATIONAL HARVESTER

Mr. Leon N. DeVos
Vinco Corporation
9111 Schaefer Highway
Detroit 28, Michigan

Dear Mr. DeVos:

Since early 1950 you and other members of the Vinco Corporation have been working closely with representatives of our Company in solving the many complex problems involved in the design, manufacture, and inspection of involute splines. During that time you and your associates have been extremely helpful to us in taking the "guess" out of involute spline manufacturing and gaging.

Because such conferences with you have been so productive, meetings of this kind are now a "must" in our farm tractor manufacturing operations. Subsequent discussions have been most helpful in establishing designs and gages for our transmission shafts and gears.

We wish to take this opportunity to thank the Vinco Corporation for the fine cooperation it has extended to our Company. This is just another example of how companies such as International Harvester and its suppliers can, by working together, produce better products for a better America.

Sincerely,

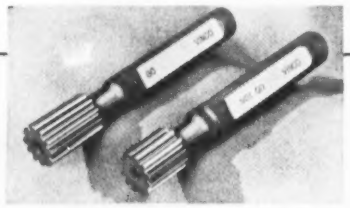
Eric A. Wolfram

Eric A. Wolfram

VINCO CAN DO THE SAME FOR YOU

So if your next production program involves splines, call in a Vinco field engineer. He will save you both time and money.

VINCO CORPORATION
9113 Schaefer Hwy., Detroit 28, Mich.



VINCO, the country's largest spline gage manufacturer, produces all types of involute, serration and straight sided spline plug and ring gages.

THE TRADEMARK OF DEPENDABILITY

VINCO
MILLIONTHS OF AN INCH FOR SALE

Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Radial

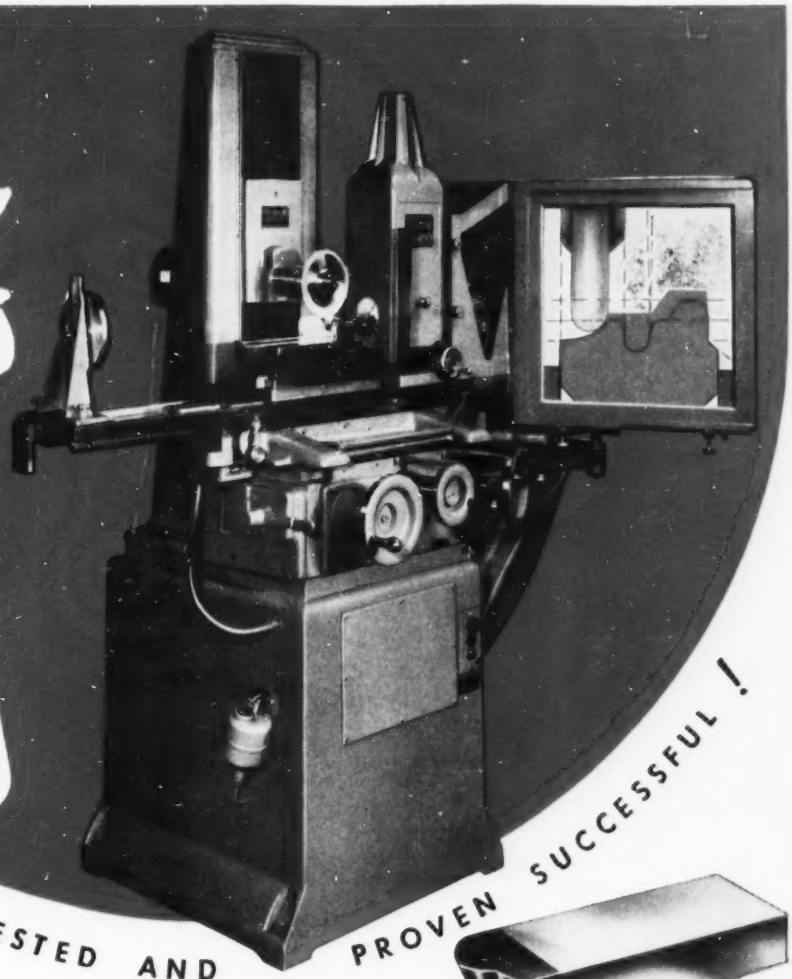
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Associated Mch. Tool Corp., P. O. Box 9666, 535 McNeilly Rd., Pittsburgh 26, Pa.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.

(*Continued on page* 374)

(For more information on products advertised, use Inquiry Card page 245)

Positive Results with VISUAL GRIND

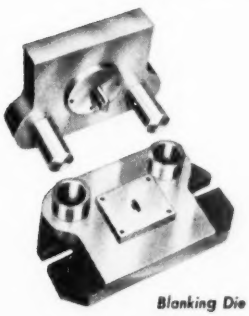
TRADE MARK



TESTED AND PROVEN SUCCESSFUL !

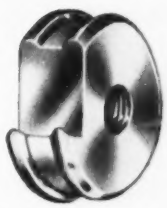


Progressive Die

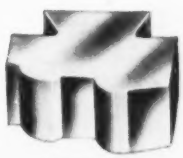


Blanking Die

Flat Form Tool



Circular Form Tool



Dovetail Tool

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Ask for Bulletin "M-10"

VISUAL GRIND

THE CLEVELAND GRINDING MACHINE COMPANY

1643 EDDY ROAD • CLEVELAND 12, OHIO

New Possibilities in Optical Grinding

EVERY TYPE PRECISION GEAR

. . . produced to your specifications

"Mass Gear" offers machining and cutting facilities for producing all types of precision gears in small and medium sizes. Gear tooth finishing and inspection equipment are backed by a competent staff of gear-producing specialists.

You can depend on "Mass Gear" service to meet your individual requirements. Submit your specifications . . . ask for a "Mass Gear" estimate.

G&T C

Massachusetts Gear & Tool Co.
WOBURN, MASS.



"All I said was our costs had gone down now that we are using Columbia EXTRA tool steel."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels—High Speed Steels
Die Steels—Hot Work and Shock Resisting Steels
Carbon Tool Steels.

TOOL COLUMBIA STEELS

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Upright

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Wall Radial

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS, Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

(*Continued on page* 376)

(For more information on products advertised, use Inquiry Card page 245)



Entrance

to The World's Most Modern Gear Manufacturing Plants

...the doorway to better gears!

When your gear orders pass through this doorway, you can leave your gear worries on the doorstep.

Skilled Illinois Gear men take over immediately with the newest and finest precision gear making equipment available *anywhere.*

Your order will be filled *on time* with gears that measure up to your most demanding specifications for accuracy, finish and high quality.



ILLINOIS GEARS

Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 N. Natchez Avenue Chicago 35, Illinois



Yes, the Ransburg story of cutting painting costs to a fraction of the cost of other methods does sound good. It *is* good!

On most factory production lines, the Ransburg electro-coating processes will provide 2 to 4 times more parts per gallon of paint—automatically—with one operator doing the work of many.

That's because the Ransburg No. 2 Process is the most efficient spray coating process ever developed for industry's use.

If you are a manufacturer of painted products, and if your work volume warrants conveyorized painting, we'd like to tell you more about the production efficiency of the RANSBURG No. 2 PROCESS as it applies to YOUR production. Too, we'd like to show you typical examples of customers' production lines where the Ransburg No. 2 Process is setting new quality standards . . . increasing production . . . and at the same time, saving manpower, money and materials.

Write for literature, or send for "Miracles In Painting" —our new 16mm. sound and color movie which shows on-the-job examples of Ransburg Processes at work in industrial plants all over the nation.

RANSBURG

Ransburg ELECTRO-COATING CORP.

INDIANAPOLIS 7, INDIANA

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric

Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

DRILLS, Portable Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

DRILLS, Rachet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist

Besly-Welles Corp., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

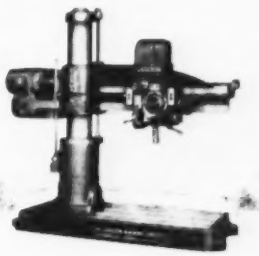
(*Continued on page* 378)

(For more information on products advertised, use Inquiry Card page 245)

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Carlton *for all your radial drill requirements*

1A---- 9″ col. 3′-4′ arms
11″ col. 3′-4′-5′ arms





3A---- 13″ col. 4′-5′ arms
15″ col. 4′-5′-6′ arms
17″ col. 5′-6′-7′ arms

4A---- 19″ col. 6′-7′-8′ arms

5A---- 22″ col. 7′ to 10′ arms
26″ col. 8′ to 12′ arms

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☐ 4A ☐ 5A

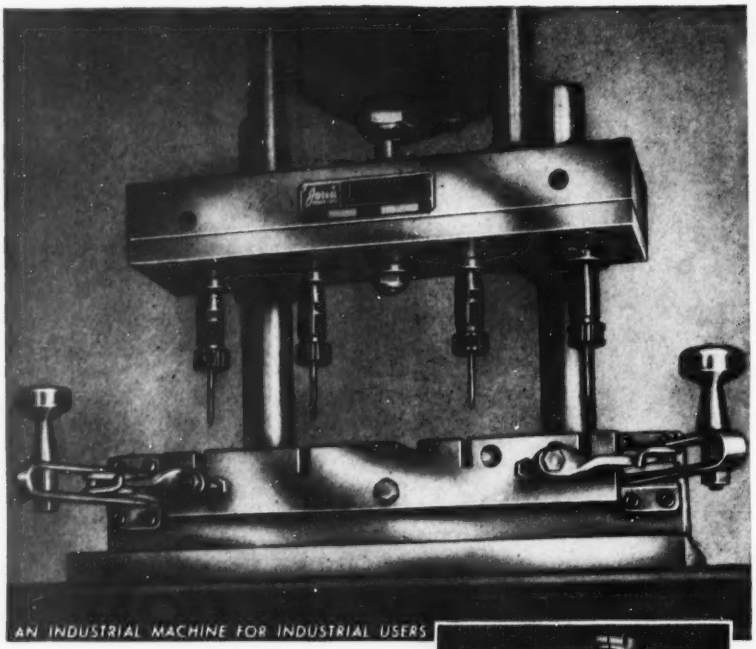
Name.....

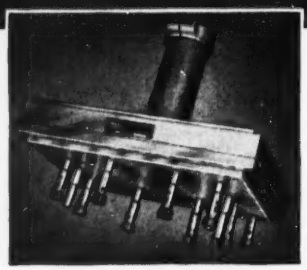
Company.....

Address.....

City.....Zone.....State.....

(For more information on products advertised, use Inquiry Card page 245)





For Multiple Tapping and Drilling . . .

Jarvis

MULTI-TAPPERS

Engineered and built to your specific production requirements from our basic standard components, Jarvis Multi-Tappers can be furnished for any type of drill press available.

We invite your inquiries—let us assist in analyzing your tapping and drilling needs!

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NEW FEATURES OF JARVIS MULTI-TAPPERS *include:*

- Aluminum case—Jig bored.
- Gear driven—positive action, silent drive.
- Ball bearings throughout.



WHEN POWERED WITH A JARVIS TORQOMATIC DRIVE THE JARVIS MULTI-TAPPER PROVIDES THE MOST EFFICIENT AND PRODUCTIVE MACHINE IN THE FIELD.

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRIVES, Chain

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
New England Mch. & Tl. Co. (Electronic), Berlin, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rickford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

DUST COLLECTORS

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

EMERY WHEELS

See Grinding Wheels

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

FACING MACHINES

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic

Bellows Co., 230 W. Market St., Akron, Ohio.
Federal Press Co., 600 Division and Big Four R. R., Elkhart, Ind.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FELT, For All Applications
American Felt Co., Glenville, Conn.

FILES, Hack
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary
Jarvis, Chas. L., Co., Middletown, Conn.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Thor Power Tool Co., Aurora, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grob Bros., Grafton, Wis.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Jarvis, Chas. L., Co., Middletown, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Keller Tool Co., Grand Haven, Mich.

FILTERS, Coolant and Oil
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cuno Engrg. Corp., Meriden, Conn.

FINISHES FOR MACHINES AND METAL PARTS
Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

FLEXIBLE COUPLINGS
See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT
Jarvis, Chas. L., Co., Middletown, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

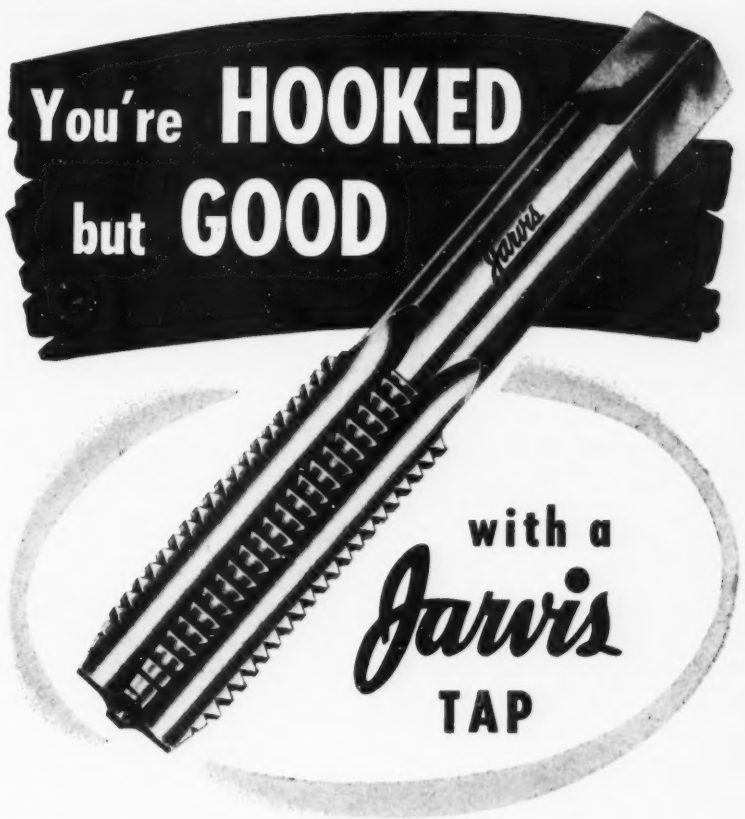
FORGING (Upsetting) MACHINES
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

FORGINGS, Drop
Bethlehem Steel Co., Bethlehem, Pa.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
(*Continued on page 380*)



We Mean, of course, the "custom made" controlled hook ground in the flutes of a Jarvis Tap. Our highly accurate machine fluting process, in which wheel radius, depth of grind and indexing are painstakingly controlled, is a guarantee that the amount of hook ground for your particular needs will be precisely met!

for a "CUSTOM MADE" Tap at no extra charge for the finest Taps made —

See Your JARVIS Representative

Jarvis POWER TOOLS

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- TAPS
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- ROTARY FILES
- TUNGSTEN CARBIDE REAMERS AND MILLS
- DRILLS
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MIDDLETOWN IN CONNECTICUT



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For over 50 years, industry has *preferred* Victor Hand, Power, and Metal and Wood Cutting Bandsaws.

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Makers of Hand and Power Hacksaw Blades, Frames, Metal and Wood Cutting Band Saws.

FORMING AND BENDING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H. Co., Detroit 34, Mich.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federail Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federail Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federail Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Homestrand, Inc., Larchmont, N. Y.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federail Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federail Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Homestrand, Inc., Larchmont, N. Y.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federail Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros. Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

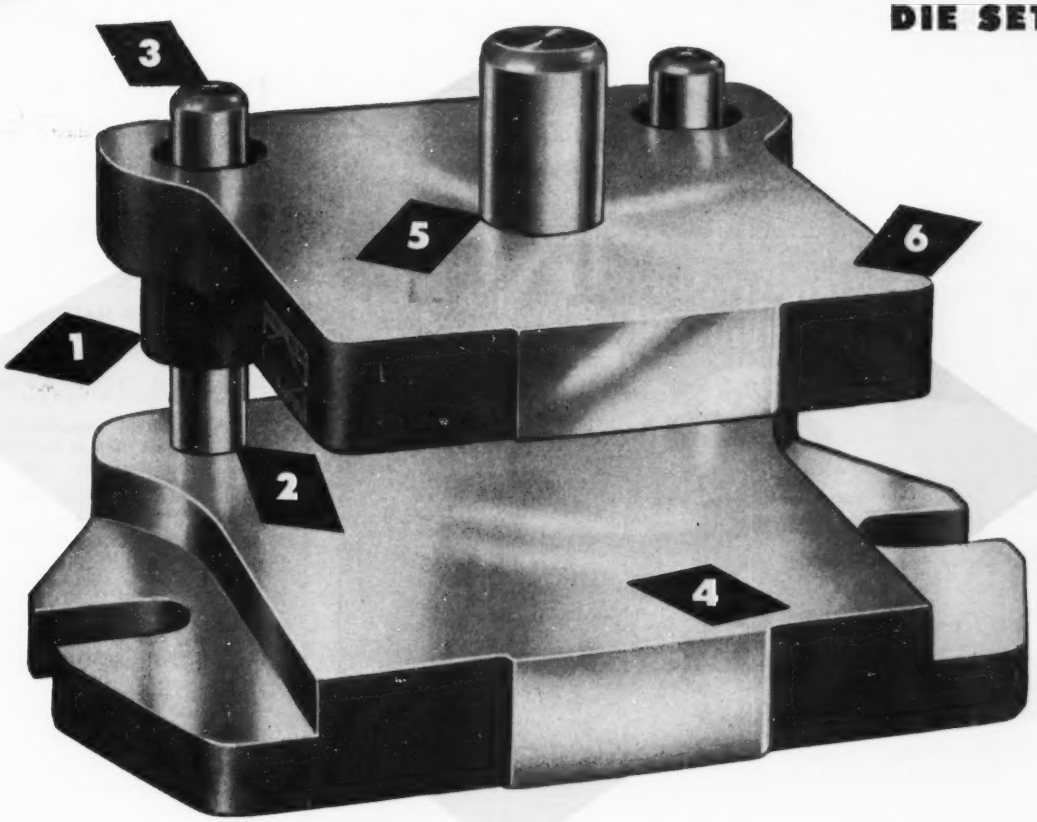
GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

(*Continued on page* 382)

(For more information on products advertised, use Inquiry Card page 245)

6 reasons for buying.. PRODUCTO DIE SETS



1. Bushings have an absolutely **uniform inside diameter,** resulting in **full-bearing** and **extra long life.**

2. New design die set gives added **strength** and assures **accurate location** of pin and bushing holes.

3. Accuracy of guide pins and bushings are **checked** on **light guages** reading to 50 millionths of an inch.

4. Parallelism and **flatness** held to **close limits** by rough machining prior to grinding.

5. Shank, cast as integral part of semi-steel die set, can be **inserted** or **welded** on all-steel sets.

6. Surface plates, accurate to within .0001", check **flatness** of ground surfaces and **parallelism** of die set.

To make an accurate die, an accurate die set must be used. For this reason, every Producto die set is an instrument of precision.

If planning a new die today, order your die set by the new Producto catalog — selection is easy, delivery is prompt.

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985 Housatonic Ave., Bridgeport 1, Connecticut

For Precision Die Sets *Fast* Call . . . . PRODUCTO

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.
5PD52A

(For more information on products advertised, use Inquiry Card page 245)

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

(*Continued on page* 384)



DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

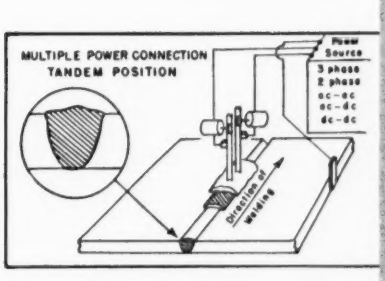
(For more information on products advertised, use Inquiry Card page 245)

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT

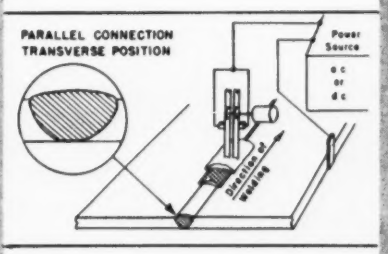
Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

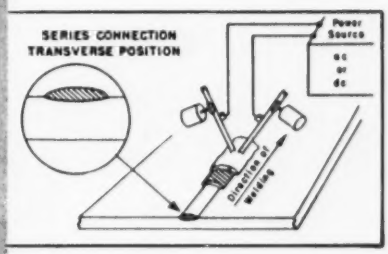
By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.



Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.



Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

Linde TRADE-MARK

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

(For more information on products advertised, use Inquiry Card page 245)

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Franke Gear Works, Inc., 1924 W. Columbia Ave., Chicago 26, Ill.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Amgears, Inc., 6633 W. 65th St., Chicago 38.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

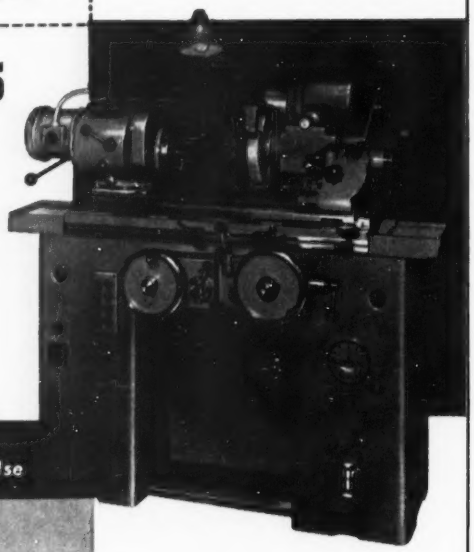
GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.

(*Continued on page 386*)

Consistent accuracy to the highest degree

. . . at a Remarkably Low Price!



KARSTENS

HYDRAULIC

Universal
(Internal & External)
Cylindrical Grinders
10" x 15"
also 10" x 20"

For Tool Room and Production Use

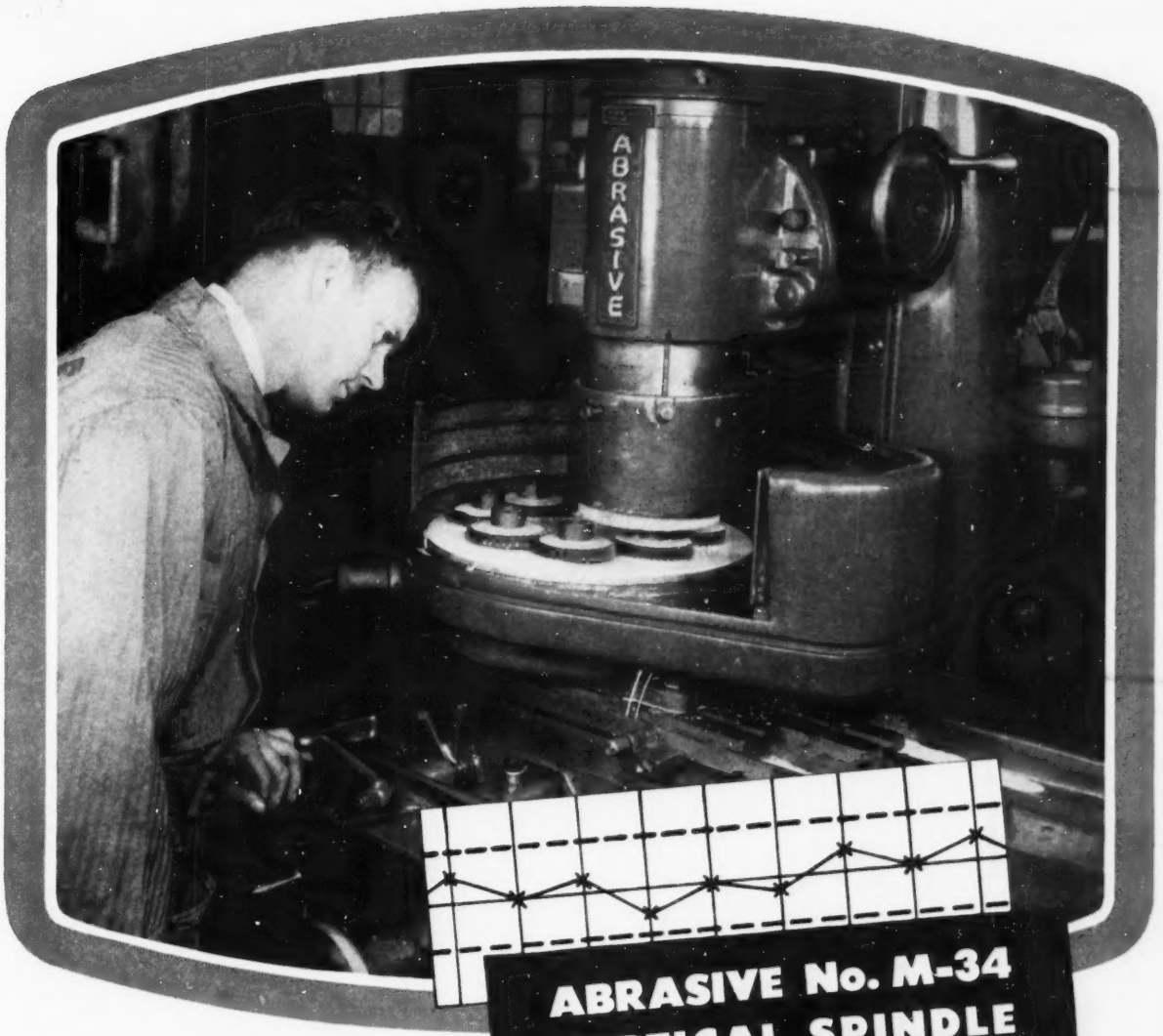
- Rigid construction.
- Easy to operate.
- Service and parts available.
- Reference installations at many leading plants.
- Minimum infeed .00005" per reversal.
- Two week delivery.
- Ultra accurate on roundness and surface finish.

Max. wheel size	10" x 3" x 1¾"
Hydraulic table speed	Infinitely variable
Headstock spindle	Variable
Collet capacity	¾"
Internal grinding spindles	16,000 to 55,000 RPM

Dealerships are available in certain localities.
Write for proposal now!

COLUMBIA EXPORT COMPANY, INC.
Machine Tools Division
10-35 44th Drive · Long Island City 1, N.Y. · STillwell 4-1546

(For more information on products advertised, use Inquiry Card page 245)



ABRASIVE No. M-34 VERTICAL SPINDLE SURFACE GRINDER

Keeps Quality in Control

Be sure of the quality of your products — use Abrasive No. M-34 Vertical Spindle Surface Grinder for production grinding of small parts. This quality-built grinder insures the quality of your grinding room output. Its 6" segmental-type grinding wheel, direct-driven by a 5 HP built-in motor, gives maximum output per machine hour . . . holds size within very close limits . . . gives ultra-fine finishes on every job.

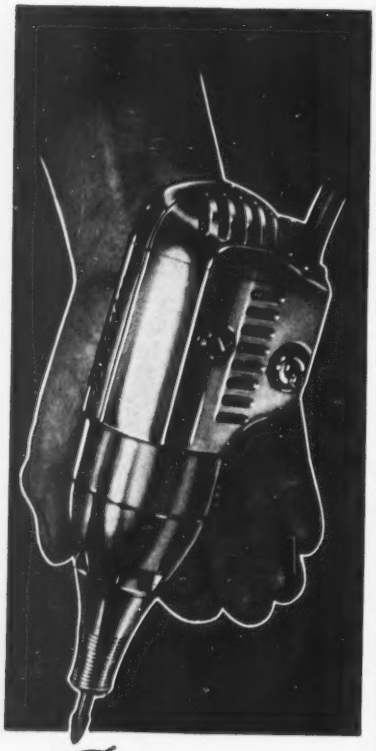
Get the facts about Abrasive No. M-34. Write for illustrated catalog. **Abrasive Machine Tool Company, 12 Dunellen Road, East Providence 14, Rhode Island.**

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

(For more information on products advertised, use Inquiry Card page 245)

NEW 45,000 R.P.M. AND 1/5 H. P. IN 35 OZ.

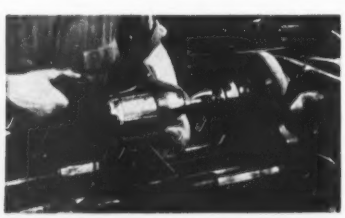


Precise

SUPER 30

OUTWORKS, OUTLASTS ANY TOOL IN ITS FIELD

Twice the power and speed in smaller size and less weight for more uses. Exclusive features include PRECISE Spindle and *draw collet* chuck for precision and quick, easy tool change. Operates *tungsten carbide* Midget Mills as efficiently as conventional rotary tools for grinding, milling, finishing, polishing and other applications on soft and hard materials including the hardest alloy steel. Micro-precision bearings have lubricant sealed in for life; AC/DC motor is air-cooled. Tool measures only 7⅜" long and tapers from 2⅛" at mounting diameter to only ⅛" D. at chuck nose. Unique PRECISE Mounts are available for set-ups on machine tools.



Write FOR CATALOG

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Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

GRINDERS, Centerless

Van Norman Co., Springfield, Mass.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

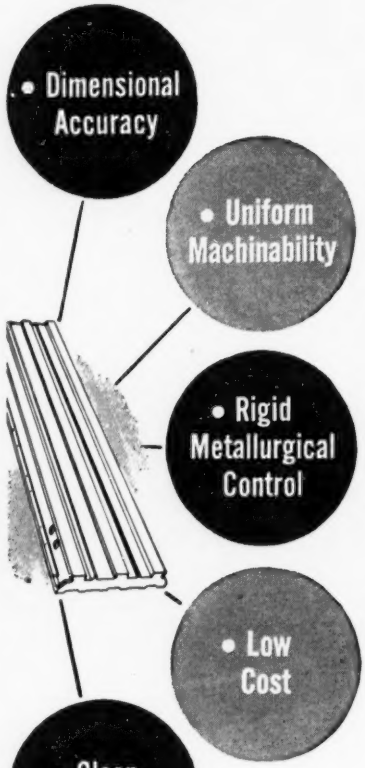
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Besly-Welles Corp., Beloit, Wis.
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(*Continued on page* 388)

HANSELL-ELCOCK for Structure Controlled GRAY IRON CASTINGS



You get all these qualities at Hansell-Elcock—whether you buy in jobbing lots or production quantities. When you want castings from 50 lbs. to 20 tons, call us at CA 5-7000 (Chicago).

Manufactures of Gray Iron Castings and Fabricators of Structural Steel for 65 years

HANSELL-ELCOCK COMPANY

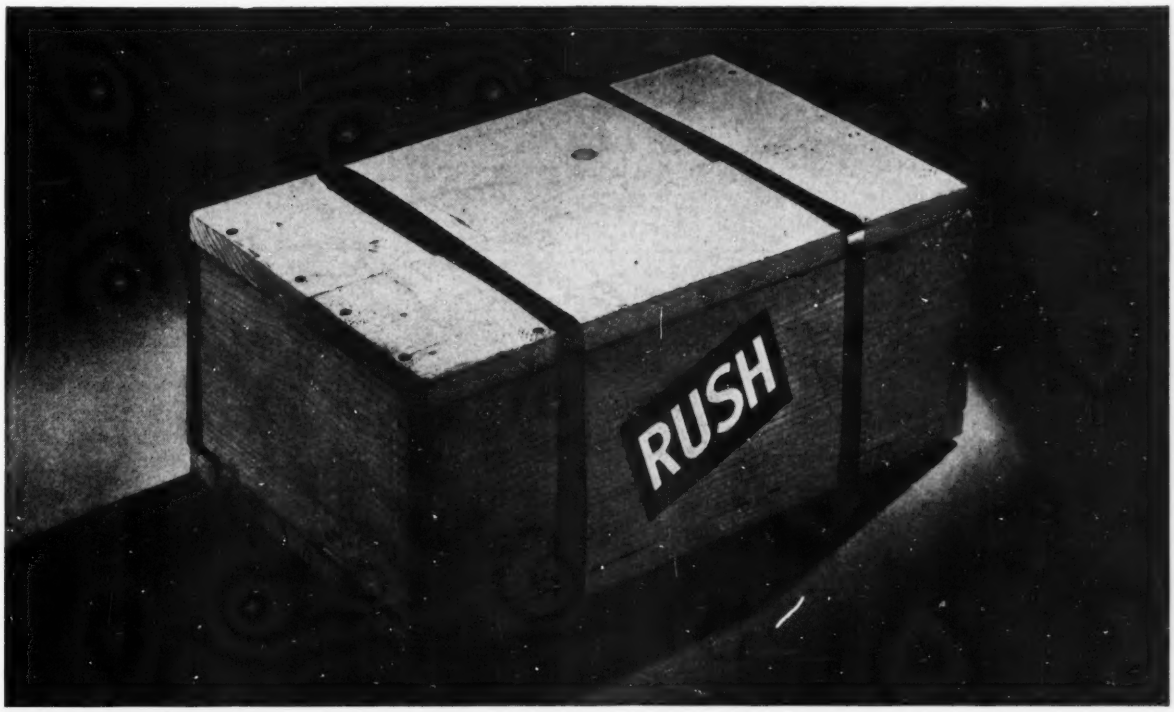
SERVING INDUSTRY SINCE 1888

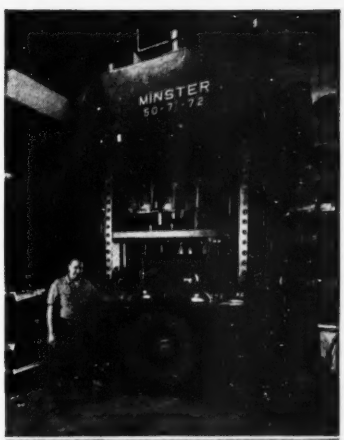
485 W. 23rd PLACE • CHICAGO 16, ILL.

(For more information on products advertised, use Inquiry Card page 245)

THREE THINGS YOU CAN EXPECT FROM

Minster Parts Service





"You can't beat Minster service,"

Says Herman Gabriel, tool and machine repair foreman, Lau Blower Co., Dayton, Ohio.

"24 out of 33 big presses in my shop are Minsters and I wish the other nine were of the same make."

When a press needs repair parts you have a right to expect three things. You *get* all three when your press is a Minster.

FIRST . . . *speed.* Minster makes an honest effort to help customers with downtime trouble. In these days we can't promise miracles but you only have to check Minster press users to find our emergency service is tops.

SECOND . . . *accuracy.* A Minster press repair part arrives ready to install. It is made as carefully as the original part.

THIRD . . . *simplified installation.* Repair of a Minster press presents no unusual difficulties. A Minster press is designed for easy access, easy replacement, easy adjustment.

Contact your nearest representative and have him show you his service records or tell you about the new Minster press designs.

THE MINSTER MACHINE CO.
Minster, Ohio

MINSTER
FIRST IN Press DESIGN

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Do All Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

AN OUTSTANDING LINE



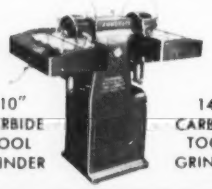
Hammond OF KALAMAZOO

CARBIDE TOOL CHIP BREAKER & DIAMOND FINISHING GRINDERS

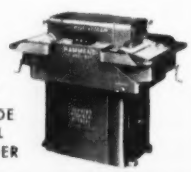


MODEL CB-77

The Hammond Model CB-77 Chip Breaker and Diamond Finishing Grinder is a *rugged performer* in Hammond's *outstanding line* of Carbide Tool Grinders. More Hammond Carbide Tool, Chip Breaker and Diamond Finishing Grinders are being used today — in more plants than ever before — to grind Carbide and High Speed Tools easily, accurately, better. Hammond offers "*America's Most Complete Line*" of Carbide Tool Grinders . . . Wet or Dry operation.



10" CARBIDE TOOL GRINDER



14" CARBIDE TOOL GRINDER

Hammond Machinery Builders INC

1619 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

See us at Booth 1150—National Metal Exposition

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDER MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

GRINDING MACHINES, Drill

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Besly-Welles Corp., Beloit, Wis.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.

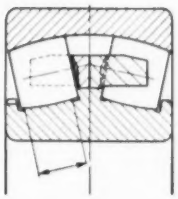
(*Continued on page 390*)

(For more information on products advertised, use Inquiry Card page 245)



the SKF improvement of internal design of spherical roller bearings

Increases capacity 25% to 50% increases service life 2 to 3½ times

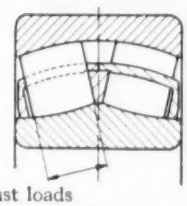


This is the Spherical Roller Bearing design originated by SKF *more than 30 years ago.* The cross-section shows how the integral inner ring flanges, and the undercuts adjacent thereto, limit the effective length of the rollers.

Now, SKF, originator of the Spherical Roller Bearing, has again provided industry with another anti-friction *first.*

This time, it's a revolutionary design advance in Series 222 and 223 bearings providing these advantages:

When designing new equipment, you can obtain the desired life by using smaller or lighter bearings at considerable cost saving. In addition, this forward step in design will carry heavier combinations of radial and thrust loads, or pure thrust loads of greater magnitude. The important self-aligning feature of SKF Spherical Roller Bearings has been preserved, so that considerable misalignment between the shaft and housing has no ill effect whatever on bearing capacity or life.



Here is the latest SKF improvement, a *revolutionary advance in design.* Effective roller guiding is accomplished by means of a separate ring. The need for undercuts is eliminated! This type of guide ring permits the rollers to take the position which their contact with the rings dictates. This assures uniform load distribution over the entire length of the longer rollers at all times. *Result*—greatly increased capacity and life.

During more than 4 years, thousands of installations have been made in railroad journals, vibrating screens, steel mill machinery and numerous other fields. In all cases performance has been outstanding.

SKF Sales Engineers in our District Offices throughout the country will assist you in making use of the important advantages of the improved internal design of SKF Spherical Roller Bearings. **SKF INDUSTRIES, INC.,** Dept. 616, PHILADELPHIA 32, PA.
— *manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

7424



This 12-page booklet gives you additional facts—sizes available—added capacity, size by size—increased life you can expect for each size—dimensional tabulations—and load and speed data. Write now for your free copy of Booklet No. 365-2.

SKF®
BALL AND ROLLER BEARINGS

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(For more information on products advertised, use Inquiry Card page 245)

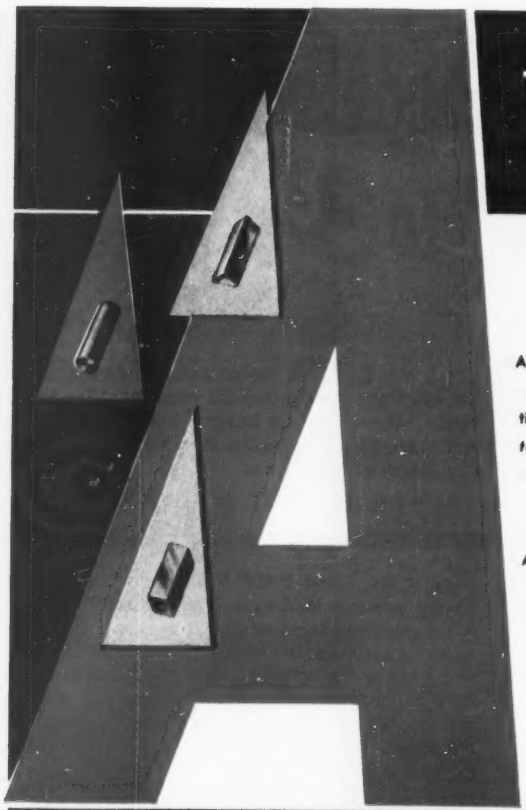
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, 32, Mich.



Teeth for the Giant

job-engineered ...and on time

The tremendous power of America's metalworking giants is often focused at the simple tip of a cutting tool. *ADAMAS tungsten carbide* tool tips are the foundation for many of today's best production records. High-quality ADAMAS carbide grades are job engineered to fit both standard and special tool tip, die and wear part applications. Delivery is *fastest in the industry.*

Write for your ADAMAS catalog today . . .

ADAMAS
TUNGSTEN CARBIDE ®

Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

GRINDING MACHINES, Jig

Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Mattison Machine Works, Rockford, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

GRINDING MACHINES, Piston Ring

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Radial, Ball Race, Etc.

Besly-Welles Corp., Beloit, Wis.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Surface

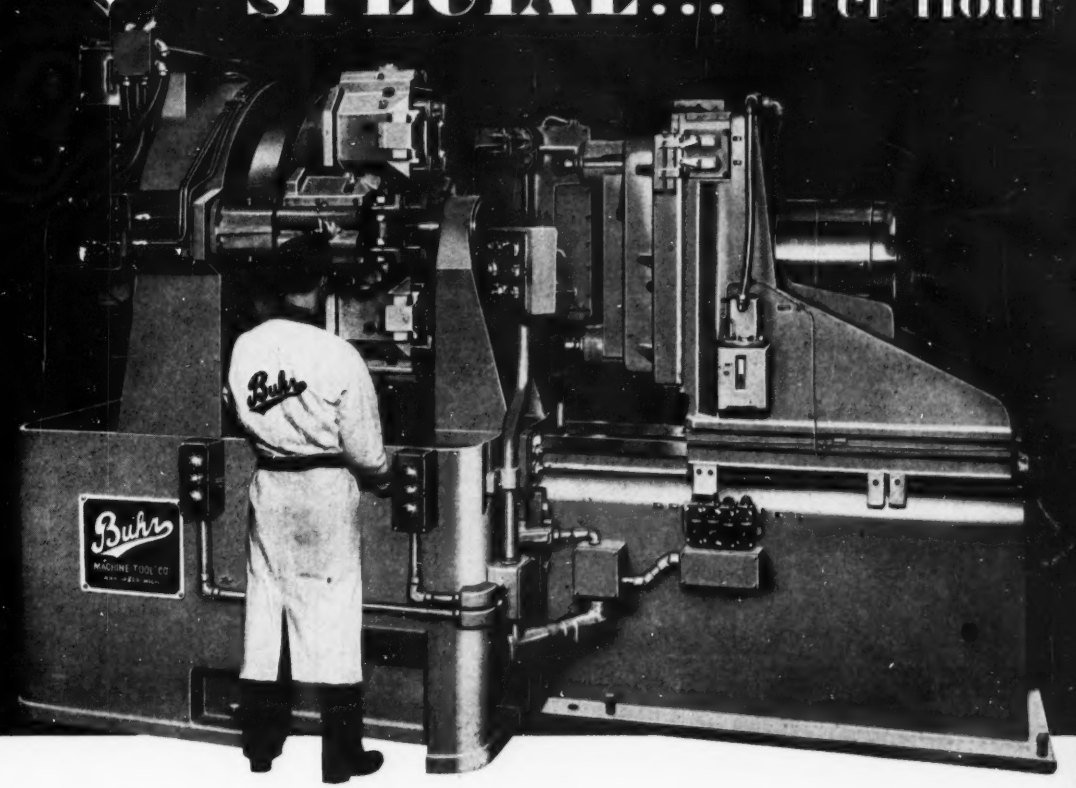
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

(*Continued on page* 392)

(For more information on products advertised, use Inquiry Card page 245)

Buhr SPECIAL...

Mills and taps 510 Oil Seal Retainers Per Hour





Fixture is arranged with hydraulically operated automatic clamping and automatic index.

Operation: Loading two parts. Station 1 — Load and Clamp.
Station 2 — Tap (2) 5/16-18 Holes and mill two Slots.
Station 3 — Idle.
Station 4 — Tap (2) 5/16-18 Holes and mill two Slots.

As with all Buhr Specials, fixtures are completely interchangeable, hydraulic and electrical installations to J.I.C. Standards, tool steel laminated, hardened and ground ways. Automatic lubrication throughout Machine.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

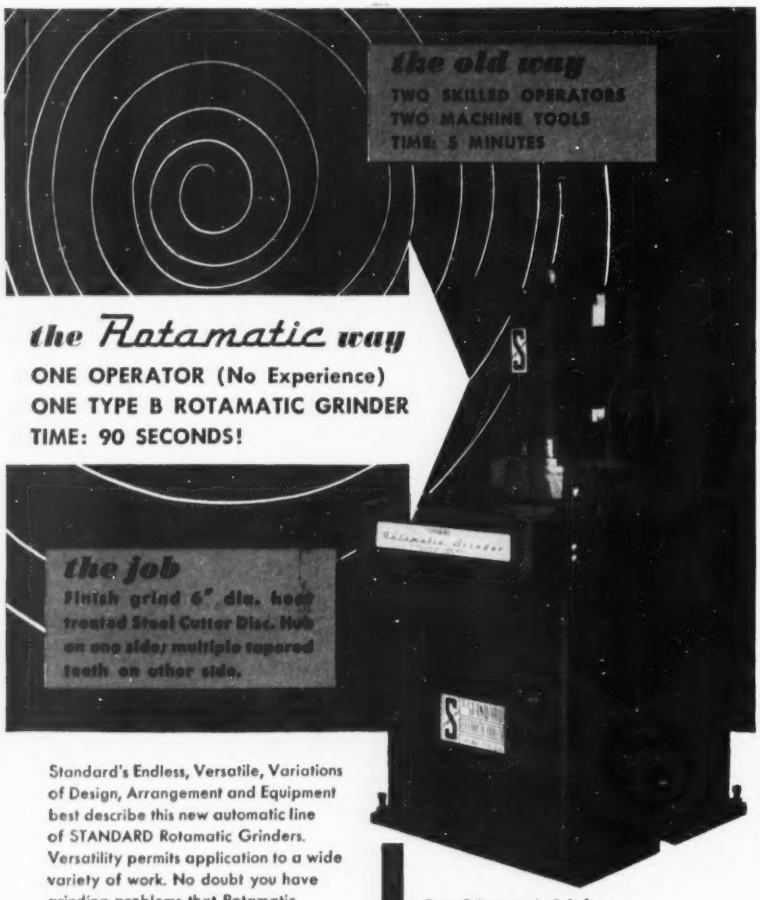
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Landis Tool Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.



Standard's Endless, Versatile, Variations of Design, Arrangement and Equipment best describe this new automatic line of STANDARD Rotamatic Grinders. Versatility permits application to a wide variety of work. No doubt you have grinding problems that Rotamatic can solve quickly and efficiently. Write us today for Catalog AG and complete details.

- ASSN Spindle Nose
- Rotary Magnetic Chucks
- Complete Hydraulic Operation
- Also 10", 12", 16" & 18" standard Rotary Surface Grinders

Type B Rotamatic Grinder

Standardize with the STANDARD electrical tool co.
MACHINE TOOLS
2500 RIVER ROAD • CINCINNATI 4, • OHIO

See this machine in operation; National Metal Exposition, Cleveland; Oct. 19-23, Booth 840.

Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Machine Co., Grinding Wheels Div., Cincinnati, Ohio.
Gardner Machine Co., (Surface Grinder) 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 200 "G" St., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Thor Power Tool Co., Aurora, Ill.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.

HARDENING EQUIPMENT

Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.

HARDENING, Surface Treatment

Electrolizing Corp., 1505 East End Ave., Chicago Heights, Ill.

HARDNESS TESTING INSTRUMENTS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Shore Instrument & Mfg. Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

(*Continued on page* 394)

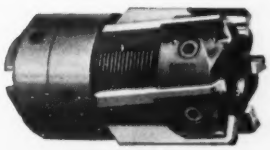
(For more information on products advertised, use Inquiry Card page 245)

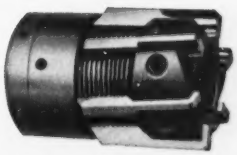
McCROSKY

COST CUTTING TOOLS

Super® Adjustable REAMERS







Chucking and Shell Designs

Sizes from 15/16" to 6" in Diameter

with CARBIDE TIPPED, Cast Alloy or High Speed Steel Blades

Standardize on McCrosky Super® Adjustable Reamers! They enable you to combine the efficiency of carbide reaming and the greater economy and longer life of inserted blade design. Our exclusive, patented, pin and screw locking device holds the blades as rigidly as a solid tool;— yet permits the blades to be released quickly; and adjusted evenly and accurately preparatory to regrinding. Consequently, only a minimum amount of the carbide is removed, saving grinding time, and minimizing purchases of replacement blades. The body lasts almost forever.

McCrosky Reamers have demonstrated their greater efficiency and economy under all kinds of work conditions. They cut freely without "chatter" . . . avoid any tendency to "dig in";— and meet every requirement of the higher operating feeds and speeds now being used in most shops.

Send for Bulletin No. R-17, and start today cutting your costs with McCrosky Super® Adjustable Cost Cutting Reamers.

McCROSKY *Universal*

MILLING CUTTERS



Body can be bladed to rotate either right or left hand. Consequently, selecting blades with tips of proper material mounted at proper angles produces a cutter that meets any metal or machine condition. Write for Bulletin No. 531 today.

McCROSKY *Jack-Lock®*

MILLING CUTTERS



Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Milling Cutters fitted with high speed steel, cast alloy or carbide tipped blades. Sizes from 3" to 24" in diameter to meet any requirement. Write for Bulletin No. 17-M.

McCROSKY *Wizard®*

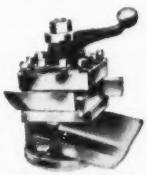
QUICK-CHANGE CHUCKS



McCrosky's Wizard Quick-Change Chuck and Collet outfits hold tools centered and rigid. They enable the operator to change tools easily and quickly, without stopping or slowing down the spindle. Successive operation jobs become continuous. Write for Bulletin 18-C.

McCROSKY *Turret*

TOOL POSTS



These tool posts permit successive tools to be swung into cutting position quickly, indexed accurately, and locked rigidly, giving engine lathes many of the advantages of turret lathes. Four styles—11 sizes. Write for Bulletin 18-T.

McCROSKY *Block Type*

BORING BARS



Individually ground and hardened tapered V-key centers the block and cutting blades accurately and rigidly yet permits easy release for regrinding, and "floating" with extreme accuracy when making finishing cuts. Wide range of stock sizes. Write for Bul. 18-B.

McCROSKY *Multiple Operation*

TOOLS



McCrosky "Specials" combine two or more related boring, facing, chamfering or reaming operations into a single tool saving set-up time and cutting costs. Engineered by McCrosky to your work prints. Write for Bulletin 17-S.

COST CUTTING TOOLS

McCROSKY TOOL CORPORATION

MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

(For more information on products advertised, use Inquiry Card page 245)

HEAT-TREATING EQUIPMENT
Ipsen Industries, Inc., 536 N. Madison, Rockford, Ill.

HOBBING MACHINES
See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Shear Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS
Bethlehem Steel Co., Bethlehem, Pa.

HOISTING AND CONVEYING EQUIPMENT
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Thor Power Tool Co., Aurora, Ill.



Here's a new fixed center Horizontal Boring Mill unit that quickly gives you toolroom accuracy and production speeds—plus versatility!

Specially designed for short and medium run jobs, a single Millholland Automatic Boring Unit can be used for a variety of jobs, and one or more units can be mounted on a bed to perform a wide range of operations. Automatic operation replaces manual lever shifts, giving a complete automatic feed cycle. Hydraulic feeds are infinitely adjustable.

The body is heavily proportioned throughout for maximum rigidity. The hardened steel alloy spindle reciprocates thru hardened steel bushings mounted in the sleeve. The sleeve is contained in two precision Timken bearings.

SPECIFICATIONS

Horsepower	5 to 10	Diameter of spindle	3"
Spindle speeds by pick-off gears	33 to 500 rpm	Morse taper of spindle	No. 5
		Length of stroke	10"

Send for Catalog M-1011

Get more information about this new Millholland Automatic Boring Unit. Let us show you how efficiently they can be applied to many of your horizontal boring mill operations.

W. K. MILLHOLLAND MACHINERY COMPANY, INC.
6402 WESTFIELD BLVD.
INDIANAPOLIS 20, INDIANA

HOISTS, Chain, Etc.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

HONES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Sunnen Products Co. (Internal & External), 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, Internal (Cylinder)
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, External
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

HONING TOOLS AND FIXTURES
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

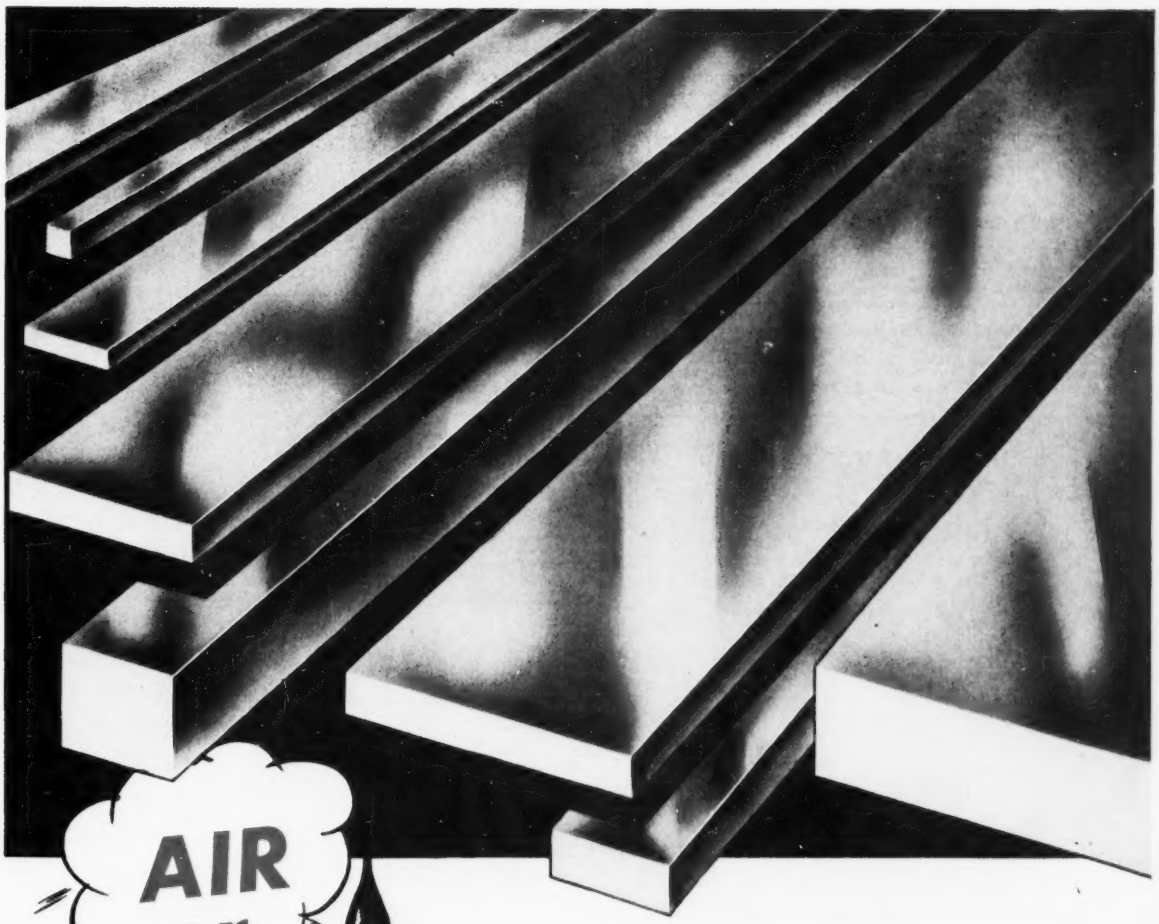
HOSE, Leather, Rubber, Metallic, Etc.
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

HYDRAULIC MACHINERY, Tools and equipment
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S, W.. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

HYDRAULIC POWER UNITS OR TOOL HEADS
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.

(*Continued on page* 396)

(For more information on products advertised, use Inquiry Card page 245)



AIR or OIL HARDENING?... which DIE STEEL is best for you?

For punches and dies that produce up to 50% more pieces per sharpening — use *Simonds Air Hardening Die Steel.* 5% chrome content makes this non-deforming steel more wear-resistant. Better for punching or cutting silicon or stainless steels, Monel metal, or other abrasive metal. Spheroidize annealed for good machinability, it also has a wide hardening range (1700° to 1800°F). Stock sizes from ½″ to 2″ thick, and 2″ to 10″ wide in 36″ lengths.

For standard die, jig, punch, gage and small tool applications, *Simonds Oil Hardening Flat Ground Die Steel* is a valuable time and money saver. Made of non-deforming molybdenum type die steel, it is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450° to 1540°F) good results are assured with even the simplest heat treating equipment. Stock sizes available from 1/64″ to 3″ thick and ⅛″ to 14″ wide in 18″ lengths. Heavier sizes also furnished in 36″ lengths.

Your Simonds Distributor stocks many sizes of both types . . . individually packaged with simple heat treating instructions. Call him for complete details.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

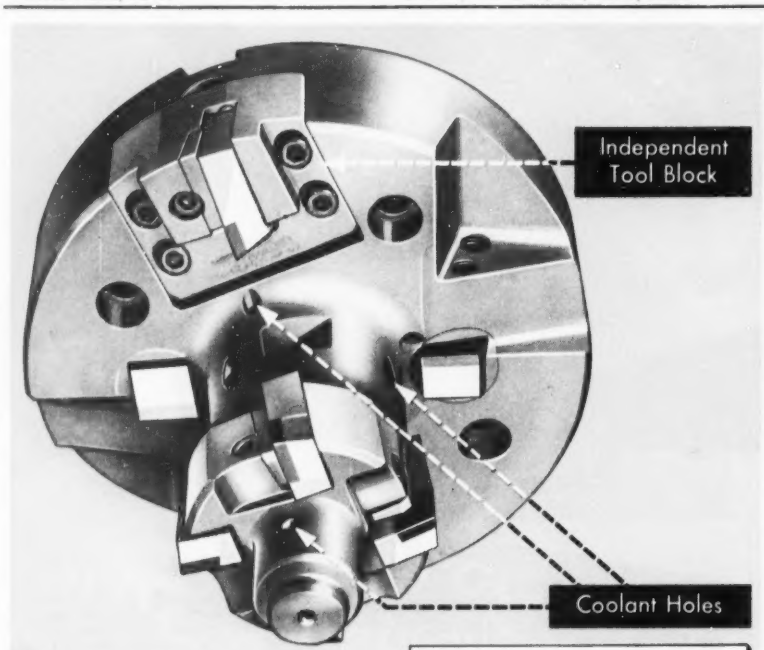
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston, 35, Mass.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

INDEXING AND SPACING EQUIPMENT

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Bellows Co., 230 W. Market St., Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

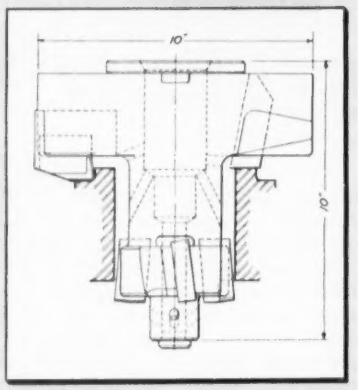
INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestead, Inc., Larchmont, N. Y.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.



Oil Hole Tool

designed for: Finished Boring / Hollow Milling / and Facing



TOOLING by GAIRING

When we say that this company has *35 years of experience*, we don't say much. Experience does not necessarily accumulate to a *company*, but grows with the *men who run it* • In our case, the same men who started this company are yet guiding it in all its branches. We started when mass production got under way, and are yet going strong doing our part in its latest developments • Write us to have our nearest representative discuss your tooling problems with you.

The GAIRING TOOL COMPANY • 21225 Hoover Road • Detroit 32, Michigan

INDICATORS, Speed

Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INSPECTION INSTRUMENTS, Visual

American Cystoscope Makers Inc., 1241 Lafayette Ave., New York, N. Y.

INTENSIFIERS, Hydraulic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Northwestern Tool & Engrg. Co., 117 Hollier Dayton, Ohio.

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Woodworth, N. A., Co., 1300 E Nine Mile Rd., Detroit 20, Mich.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.

LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating), 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).

(*Continued on page* 400)

(For more information on products advertised, use Inquiry Card page 245)

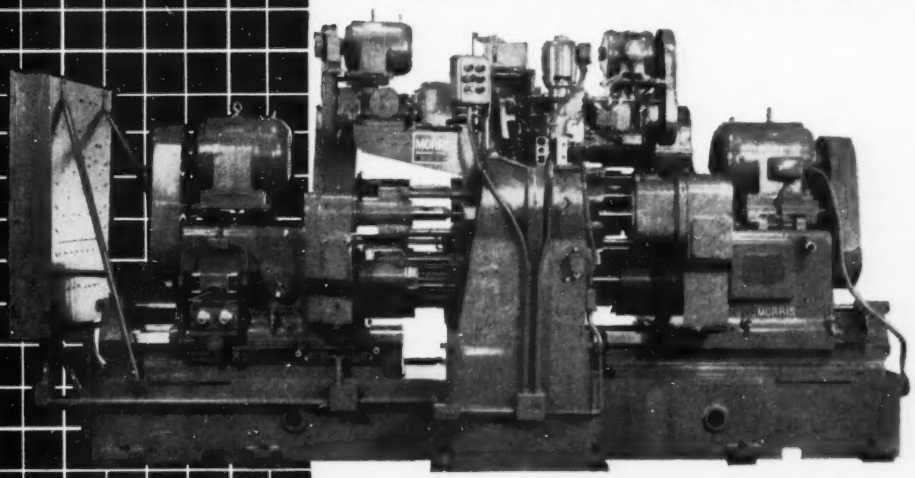
35% SAVINGS IN LABOR
REPLACES 6 OLDER MACHINES
PAYS FOR ITSELF IN 9 MONTHS

Another typical
Morris
MOR-SPEED
production machine
performance record

The two way horizontal, eight station, automatic indexing machine illustrated drills, reams, countersinks, forms radius and taps 187 refrigeration unit cylinders per hour.

This unit is equipped with nineteen drilling spindles, fourteen countersinking spindles, four counterboring spindles, one reaming spindle and eleven tapping spindles. Twenty spindles are in the left hand head and eighteen in right hand head.

If your work requires numerous operations on a mass production basis, consult us. Our engineers are eager to serve you.





OPERATIONS PERFORMED:

Drill, countersink and tap 8,—¼"—28 tap holes

Drill, ream and chamfer both ends of 1⅛" hole

Counterbore for ⅝" dia. segment

Drill, countersink and tap 1—$\frac{8}{32}$ tap hole

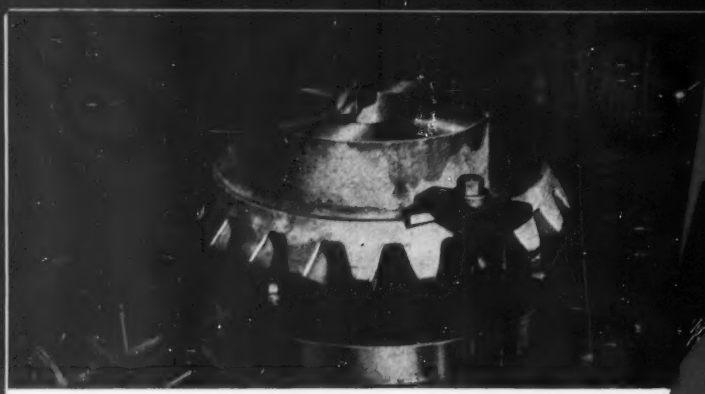
Drill, countersink and tap 2—⅜—24 tap holes

*Refrigeration Unit Cylinder

Morris **THE MORRIS MACHINE TOOL CO.**
946 Harriet Street, Cincinnati 3, Ohio

"A Better Product at Less Cost with PRECISION PLUS PRODUCTION."

(For more information on products advertised, use Inquiry Card page 243)



The two keyways in this big, 445 pound, cast iron gear are 90° apart; back of slots taper ⅛" per foot. Finish machining — requiring removal of ⅛" of metal hardened to over 50 Rockwell—was accomplished in 64 minutes with a single set-up.



A P&W Vertical Shaper machined the *thirty-five* different surfaces and irregular shaped slots in this box jig . . . without a single change of set-up.



This 6-inch punch of die steel is another job completed in a single set-up without special fixtures of any sort. Notice the intricate form required in each segment.

MORE JOBS SHAPES PROFITS

LESS WORK TIME SET-UP CHANGES SPECIAL FIXTURES

ON

"The Handiest Machine in Your Shop"



Figure this performance in your own profit picture. A Pratt & Whitney Vertical Shaper accurately machined this die and shoe in just 8¼ hours . . . saving 34¾ hours over former methods.

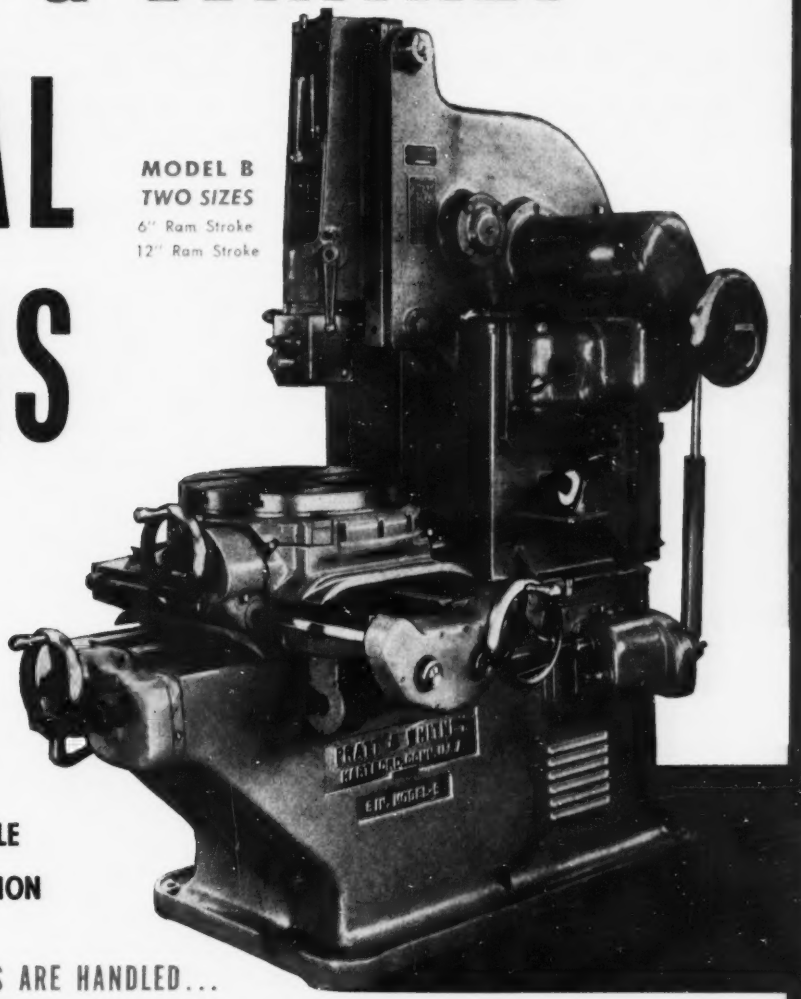


Power rotary feed to the table pays off . . . by producing for example, small quantities of cams and similar pieces when regular equipment is not available. This cam was machined in 3 hours.

PRATT & WHITNEY

VERTICAL SHAPERS

MODEL B
TWO SIZES
6" Ram Stroke
12" Ram Stroke



- **DEPENDABLE ACCURACY**
- **CONVENIENT OPERATION**
- **RIGID, RUGGED CONSTRUCTION**
- **BETTER VISIBILITY**
- **ACCURATE INDEXING**
- **POWER ROTARY FEED to the TABLE**
- **HEAVY CUTTING with FINE PRECISION**

EVERYWHERE THAT IRREGULAR SHAPES ARE HANDLED...

in the die shop, tool room or repair shop, Pratt & Whitney Vertical Shapers will machine your difficult jobs faster, more accurately and more profitably. Versatile, powerful, accurate — they handle a wide variety of pieces that cannot be machined economically by any other method.

P&W vertical design transfers cutting pressures directly to the table and bed, eliminating springing and assuring permanent accuracy. Cutting action tends to hold the work in place. This feature — plus the built-in rotary table with power feed — makes work holding and indexing simple. Costly set-up changes and expensive jigs and fixtures are practically eliminated. Open construction with no overhanging tool head permits better visibility and provides easy accommodation for a wide range of work sizes.

SEND NOW FOR COMPLETE INFORMATION — Write on your Company letterhead to the Pratt & Whitney Branch Office nearest you or direct to West Hartford; ask for Circular No. 423-7.



PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice for Accuracy

Branch Offices—BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stowell Co.) • DETROIT • HOUSTON (The Stowell Co.)
LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., West Hartford

MACHINE TOOLS • CUTTING TOOLS • GAGES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Inc., Torrington, Conn.
Jones & Lamson Mch. 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

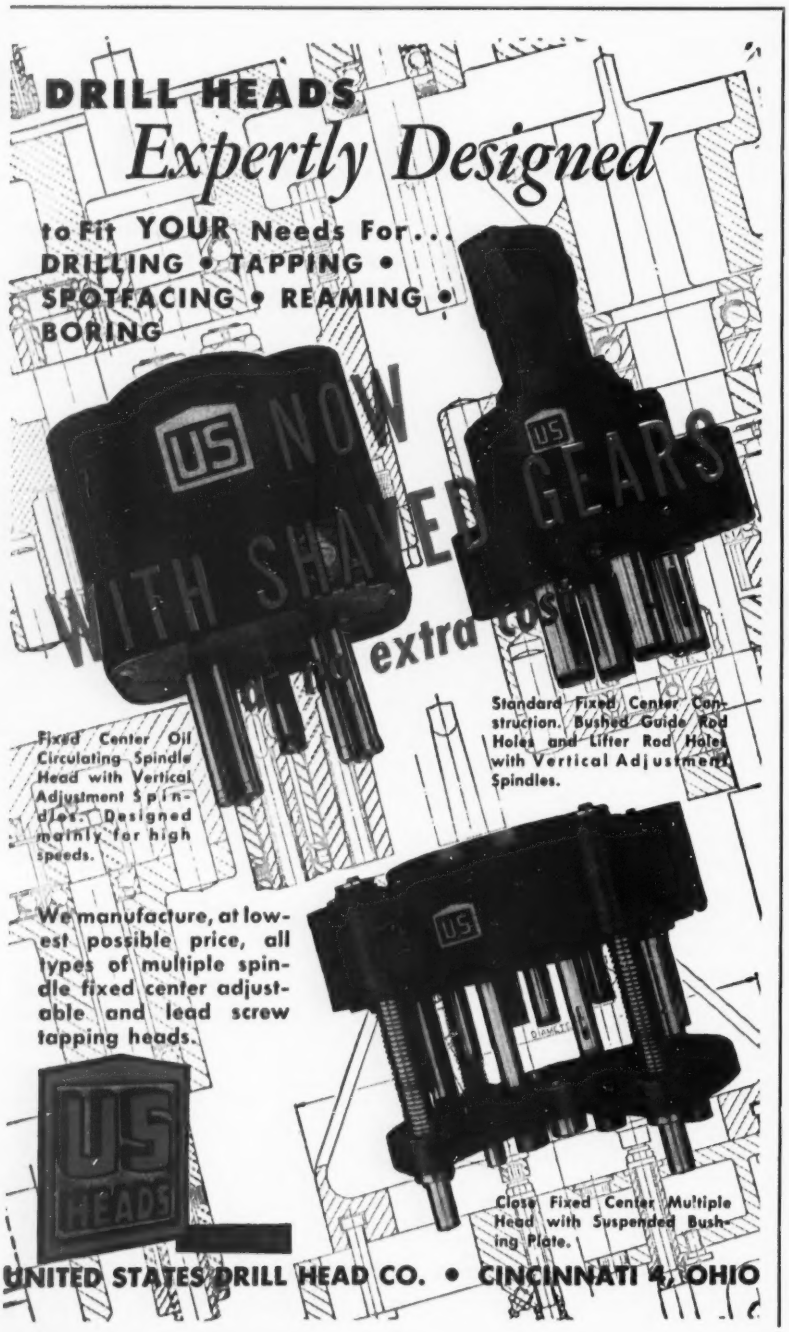
LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

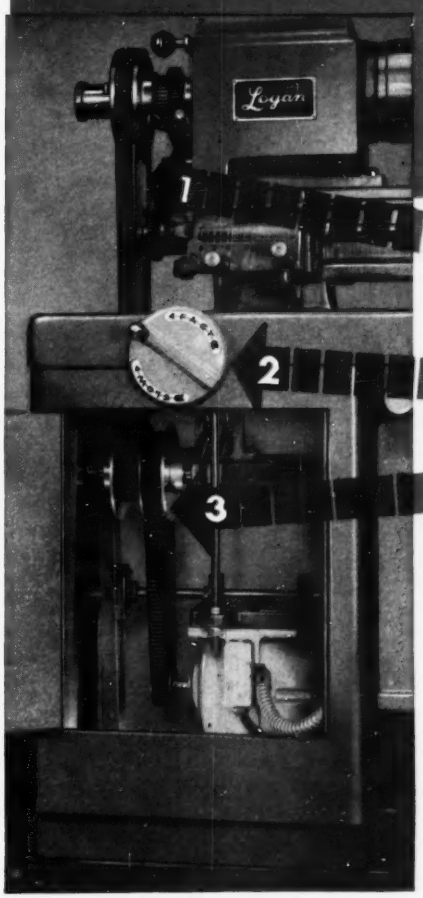
Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

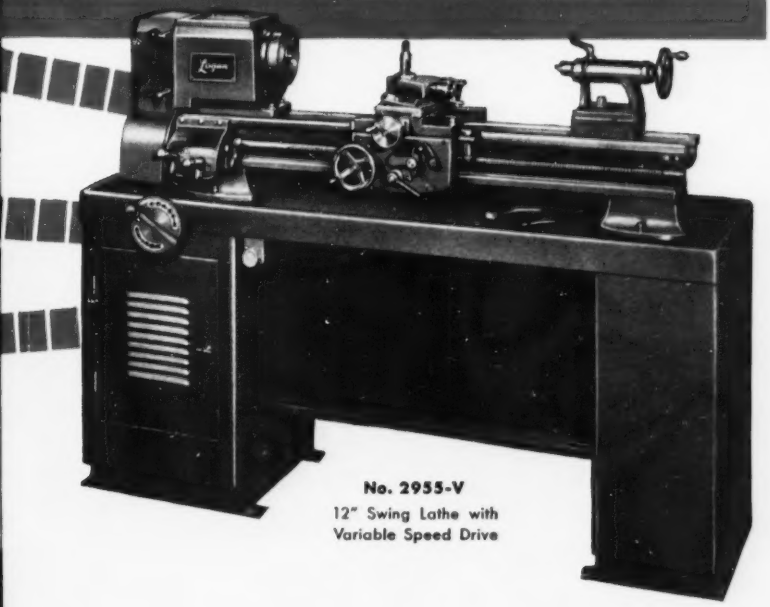
(*Continued on page* 402)



(For more information on products advertised, use Inquiry Card page 245)

VARIABLE SPEED DRIVE NOW OPTIONAL ON... Logan 12" SWING LATHE At No Extra Cost





No. 2955-V
12" Swing Lathe with
Variable Speed Drive

Principal Variable Speed Drive Parts

1 Upper Section showing spindle V-pulley and Vari-Speed belt.

2 Vari-Speed Control

3 Lower section, showing Variable Speed V-Pulleys and Vari-Speed belts.

Belts are easily replaced. Spindle Speed Chart on gear guard provides clearly marked settings for various speeds.

SEE IT AT YOUR LOCAL LATHE DEALER'S, OR

Write for Information...

Full catalog descriptions and price information on request. WRITE TODAY TO

Provides Infinite Spindle Speeds, 38 to 1575 rpm.

The rugged, accurate Logan 12" Lathe is now available with either standard V-belt Drive, or the new Logan Variable Speed Drive, *at the same economical price*. Where the work handled requires a variety of spindle speeds, the time-saving speed correction of the Logan Variable Speed Drive definitely reduces costs. On large diameter facing, for example, the optimum surface speed is maintained by simply turning the Variable Speed Control Handle as the cutter goes into the work. No need to stop the lathe. No belt shifting. One control handle provides infinite spindle speeds between 38 and 1575 rpm, with all speed changes made *while the lathe is running*. This new optional feature, together with such standard Logan advantages as the massively proportioned ball bearing spindle; the balanced bed with the two V-ways and two flat ways precision ground; and the convenient new carriage . . . make the 12" Logan the lathe for profitable work.

Brief Specifications of Logan 12" Lathes

Swing over bed and saddle wings, 12"... Center Distances, 23" and 35"... Turret Lathes Models have 43" bed length... 1⅜" spindle hole... 1" collet capacity... 16 standard V-belt drive spindle speeds, 35 to 1230 rpm... Variable Speed Drive Models, infinite spindle speeds from 38 to 1575 rpm.

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.

Lawrence and Lamon Avenues • Chicago 30, Illinois

(For more information on products advertised, use Inquiry Card page 245)

LATHES, Duplicating

H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hendey Machine Co., Inc., Torrington, Conn.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Corp., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.



For All Sheldon Lathes less than 5 Years old...we have just published a new Parts List Manual, with:



. . . . every lathe part and sub-assembly illustrated, named, numbered and positioned on explanatory exploded drawings.

. . . . a section which illustrates and describes each of over 50 modern Attachments and Accessories to make your Sheldon Lathe even more versatile, productive and valuable to you.

To get this valuable Parts List (and Accessory) Manual just write (1) the serial number of your Sheldon Lathe and (2) your name, and (3) your firm name and address, on a post card, letterhead, billhead or slip of paper and mail it to "Parts Manual".

SHELDON MACHINE CO., INC.
4246 North Knox Ave., Chicago 41, Illinois

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.

LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

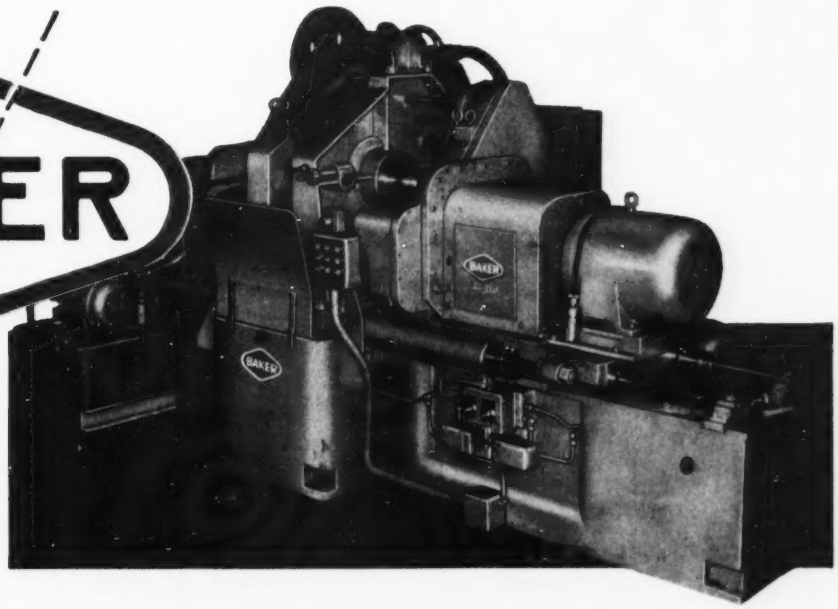
(*Continued on page* 404)

(For more information on products advertised, use Inquiry Card page 245)

Modern Machine Tools..

SLASH PRODUCTION COSTS!

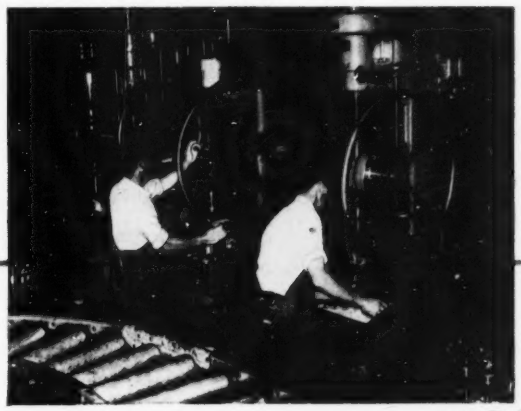
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1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload

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Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

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BAKER BROTHERS, INC. Toledo, Ohio
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

(For more information on products advertised, use Inquiry Card page 245)

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PILOT RUNS



SPECIAL METHODS PRODUCE SMALL QUANTITIES AT MINIMUM COST.

When you need just a few pieces — when you're still in the experimental stage—then an economical, cooperative source of parts is important.

Our **Machine-Cut Method** avoids custom die costs completely by use of special machinery which skillfully fashions pilot quantities.

Careful calculation determines the point at which labor costs warrant our **Short Run Method,** which uses simple contour dies and special purpose presses.

Best of all, when you get into large quantities on the experimental part, our STAMPINGS DIVISION is still your most economical producer, using our **Production Method.** Thus all three methods are at your disposal. And impartial choice of method *saves money* for you!

STAMPINGS DIVISION

LAMINATED SHIM COMPANY, INC.

3910 Union Street, Glenbrook, Conn.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LOCKNUTS

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

LUBRICATING SYSTEMS

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Farvel Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MANDRELS

See Arbors and Mandrels.

MARKING MACHINES AND DEVICES

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS

See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Groton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
New England Mch. & Tl. Co., (Electronic) Berlin,
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Columbia Export Co., Inc., 10-35 44th Dr., Long Island City, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Fray Machine Tool Co., 151 W. Windsor Rd., Glendale 4, Calif.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st. St., Milwaukee 14, Wis.
Marac Mchry. Corp., 1819 Broadway, New York, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Planetary Type

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Groton, Geo., Mch Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

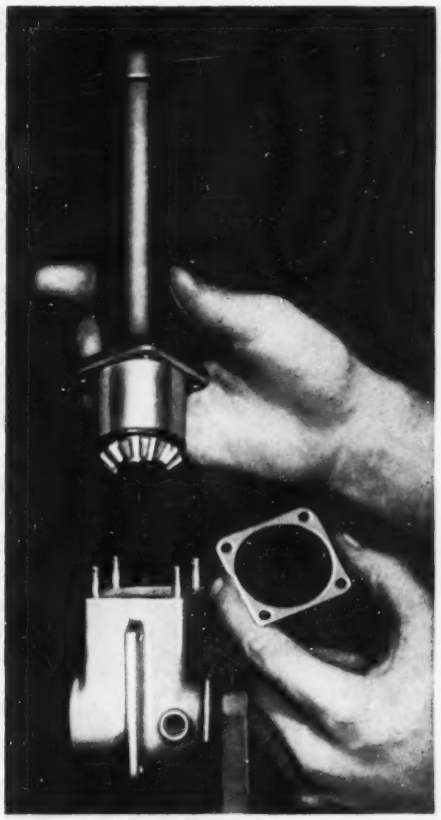
MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

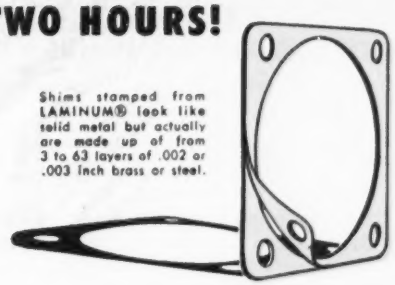
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Miling Mch. Co., 2442 Douglas St., Rockford, Ill.

(*Continued on page 406*)



2 Seconds

CAN SAVE YOU TWO HOURS!



Shims stamped from LAMINUM® look like solid metal but actually are made up of from 3 to 63 layers of .002 or .003 inch brass or steel.

Adjusting bevel gear mesh with a laminated shim is a matter of two seconds to remove a lamination!

The shim in this case is made of LAMINUM®, our exclusive material. It is a "solid" unit built up of 16 layers of .002 brass. It peels quickly and easily. Each shim removed adjusts the bevel gear position by two thousandths.

You save time by easier machining tolerances on the housing; ***you save time*** by eliminating pesky assembly machining; ***you save*** by not tying up a machine intermittently. IT'S EASIER!

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FOR PRECISION GROOVING RECESSING AND BACKFACING

Versatile **MAXWELL** recessing tools can be used on any drill press, boring mill, turret lathe, radial drill or milling machine. Ball-bearing pilots and high speed or carbide cutters are interchangeable to handle any job within range of holders.

MAXWELL recessing tools are precision built for sustained accuracy in production runs . . . yet take cuts at unusually high feeds. Features include automatic release to permit rapid indexing and repositioning and easy access to graduated adjusting collar for regulating diameter of recess. 4 sizes available for ⅜ to 4-inch holes.

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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

(*Continued on page* 408)

PUMP GUIDE

for Maintenance Men...



NEW CATALOG ON

TUTHILL MODEL CK HIGH-PRESSURE PUMPS

NOW READY TO HELP YOU

This concise book gives you types and sizes of Tuthill High Pressure Pumps to meet any requirement for hydraulic service where the operating pressure does not exceed 400 p.s.i. Included is data on the following types in capacities from 5 to 200 g.p.m.



MODEL CK—Compact, self-priming, uni-directional. Spring-loaded packing. Direct drive or belted units.



MODEL CKB—Same as Model CK, with dependable Tuthill mechanical shaft seal.



MODEL RCK—Includes Tuthill's exclusive automatic reversing feature. Available also with mechanical seal as Model RCKB.

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Dependable Rotary Pumps since 1927

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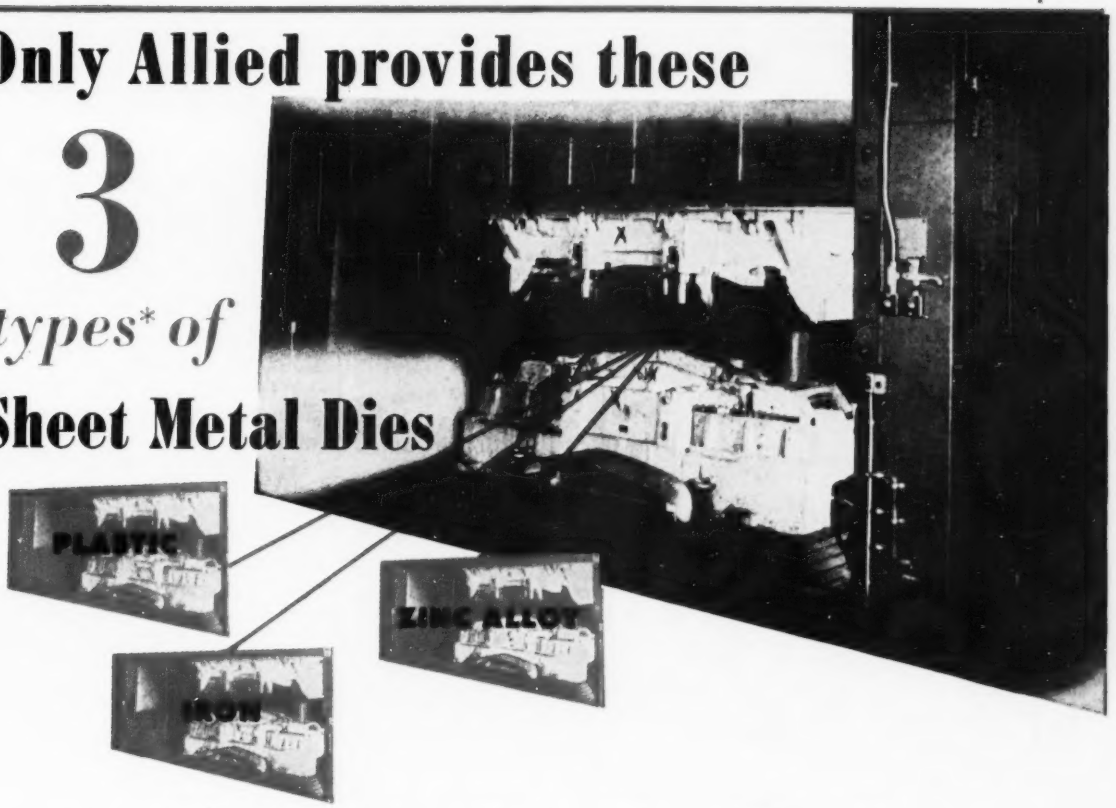
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Only Allied provides these

3

types of*

Sheet Metal Dies



To Give You the Best Die...The Most Economical Die...for Your Production

**Combinations of materials are also used.*

Other Allied Products

SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • R-B INTERCHANGEABLE PUNCHES AND DIES

How can a *complete* sheet metal die service, such as Richard Brothers Division offers, result in substantial time and cost savings for you?

Suppose you have a few experimental parts to produce. Here a die made of Rezolin Tool Plastik may prove to be the answer. As this material does not shrink or expand, it permits fast, low-cost production of accurate dies. Where production runs exceed the limitations of plastic dies, yet still are not in very high volume, Allite zinc alloy dies can be used—again with savings of time and money by comparison with hard dies.

When the parts are required in high volume, the experience gained in the use of the plastic or zinc alloy dies is applied in the manufacture of the production dies. The true die conditions demonstrated in short-run production make possible a direct approach to building the long-run dies, with resulting savings in development, finishing and tryout.

Here at Richard Brothers Division—under one roof—you have a sheet metal die service that is unique—that can be put to work for you to cut your production costs. Why not investigate its possibilities . . . today?

PRECISION • EXPERIENCE • RESPONSIBILITY

ALLIED PRODUCTS

ALLIED PRODUCTS CORPORATION

DEPT. D-13 • 12619 BURT ROAD • DETROIT 23, MICH.



PLANT 1
Detroit, Mich.



PLANT 2
Detroit, Mich.

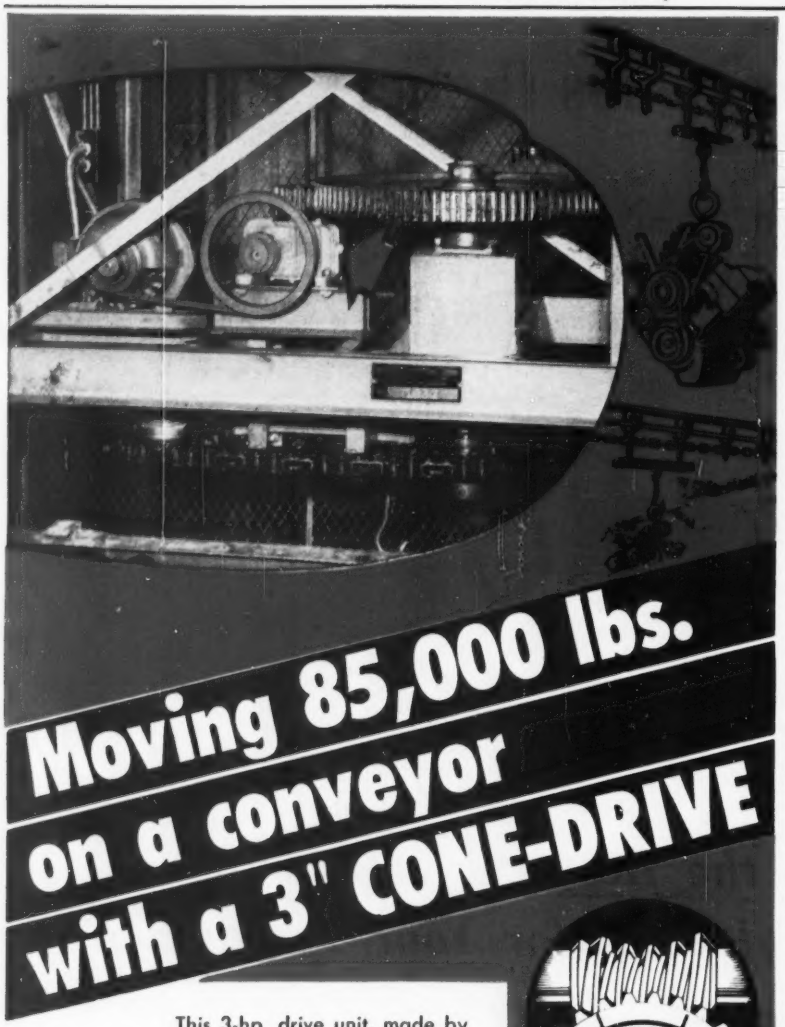


PLANT 3
Hillsdale, Mich.



PLANT 4
Hillsdale, Mich.

(For more information on products advertised, use Inquiry Card page 245)



Moving 85,000 lbs. on a conveyor with a 3" CONE-DRIVE

This 3-hp. drive unit, made by General Conveyors Corp., Van Dyke, Michigan, for a 1500-ft. long monorail conveyor, carries half the load of moving 170,000 pounds of V-8 automotive engines hour after hour, month in and month out. It's the kind of modern installation that demands continuous trouble-free operation.

That's why General Conveyors engineers specified standard 3-in. center distance, 15 to 1 ratio, Cone-Drive speed reducers for each of the two synchronized drives.

The ruggedness and maintenance-free long wear life of standard Cone-Drive reducers make them 'naturals' for conveyor drives. In addition, original units or replacement parts for these units can be delivered off-the-shelf for any emergencies.

Standard double-enveloping Cone-Drive gearsets and reducers have greater contact per tooth, more teeth in contact, increased load capacity, greater shock load capacity, longer life, lighter weight—and lower overall cost.

Ask for "Cone-Drive Gears at Work in Materials Handling." (Bulletin #MH-53) for more case histories.

CONE-DRIVE GEARS
Division Michigan Tool Company
DOUBLE ENVELOPING GEAR SETS & SPEED REDUCERS
7171 E. McNichols Road • Detroit 12, Michigan

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Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.

OIL CUPS
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL EXTRACTORS AND CLEANERS
De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS
Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL SEALS
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.
Madison-Kipp Corp., Madison, Wis.

OILS, Cutting
See Cutting and Grinding Fluids.

OILS, Lubricating
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

OILS, Quenching and Tempering
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble
See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.

ORDNANCE MACHINES, Spelial
Rehnberg-Jacobson Mfg. Co., 2135 Kiswaukee St., Rockford, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PAINTING EQUIPMENT, Spray
Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal
Mummert-Dixon Co., Hanover, Pa.

(*Continued on page* 410)

(For more information on products advertised, use Inquiry Card page 245)

Are machine tool "tapeworms" eating up your maintenance dollars?

Don't tear the hide off your plant engineer every time maintenance costs surge high. Check into your machine tools *first*. Chances are that "tapeworms" lurk deep inside their gizzards—draining your plant production system, eating up your maintenance dollars.

Extricate machine tool "tapeworms" with Engineered Rebuilding

Factory Magazine reports that two out of every five plants review their equipment. It's the first step towards rebuilding. It's the only way to pinpoint your troubles, halt breakdowns of machinery that account for so much of your downtime, wipe out uncountable costs in repairs and new equipment.

Break down your maintenance costs by machine tools

Factory says this is being done today by three out of ten plants, indicating it has a lot of value. Obviously, there's still plenty of by-guess-and-by-gosh among the other plants. If you ever want to isolate this major drain on your maintenance budget, *now is the time to start.*

Report those progress checks

Top management needs this information to pull a machine tool for rebuilding *when the tool needs it—before the heavy expense starts.*

Exactly what is Simmons Engineered Rebuilding?

It's *complete* rebuilding and modernization "from the ground up." It includes dismantling down to main castings, thorough cleaning, testing of all bearings, replacement of worn parts, rewiring of electrical circuits...plus the introduction of up-to-the-minute features that enable the machine to operate at an even *higher* capacity than when it was brand new. The rebuilt and modernized machine tool is "witness-tested" on the Simmons plant floor. A Simmons service engineer checks its performance with your inspector under actual working conditions; OK's it only if its productive capacity equals or exceeds its original capacity when new.

Simmons Engineered Rebuilding delivers *guaranteed* satisfaction, delivers it faster and at bigger money savings, especially on the larger-type tools.

Cut your maintenance costs with this simple plan:

1. On your next maintenance check, note especially those complex, hard-to-replace machine tools. Are they operating as well as they might?

2. If not, list the ones you can temporarily spare.

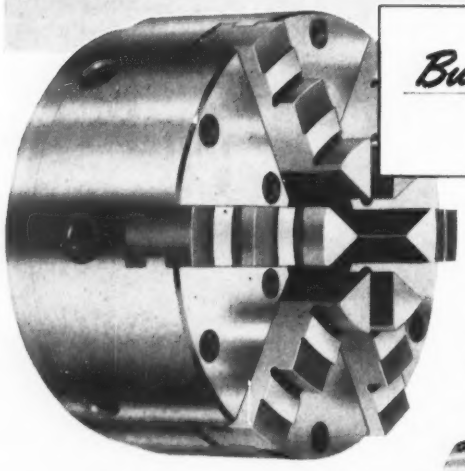
3. Send us this list of machines. We'll promptly quote prices and deliveries. And you'll receive our fact-packed periodical, THE SIMMONS WAY.

SIMMONS MACHINE TOOL CORPORATION
1600 North Broadway, Albany 1, New York
New York Office: 50 East 42nd Street
Phone in New York: MUrray Hill 2-5941
Phone in Philadelphia: VIctor 8-3133
Phone in Pittsburgh: PEnhurst 1-3700



(For more information on products advertised, use Inquiry Card page 245)

FASTER PRECISION CHUCKING AT MUCH LESS COST!



Buck AJUST-TRU CHUCKS

Lines up dead true in less than a minute. Rechucks to .0005 precision at scroll chuck speeds. Ends most needs for collets, step-collets, mandrels, stub arbors. Does the work of over $1,000 in special equipment, at no premium in price. It's the most revolutionary development in 50 years. Send for full details.

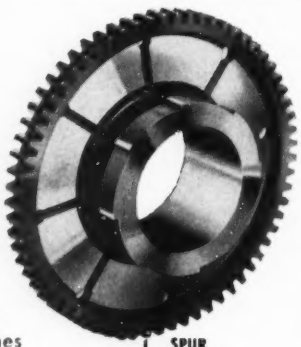


Buck 3-JAW CHUCK
In 4", 5", 6" and 7½" diameters. 3 external, 3 internal jaws. Complete line of adapters for all Ajust-Tru chucks.

Buck 6-JAW CHUCK
WITH 6 EXTERNAL, 6 INTERNAL JAWS
4", 5", 6", 7½" DIAMETERS

BUCK TOOL COMPANY
1020 SCHIPPERS LANE
KALAMAZOO, MICHIGAN

GEARS GALORE



In over 45 years of custom-gear making, we've produced gears for thousands of different uses and products. We've made gears for diesel engines and driers and drilling equipment; for machine tools and marine drives and medical equipment—gears of all types and sizes, for all kinds of jobs. We've learned from experience that no two gear requirements are entirely identical—that each gearing problem requires a separate solution. And from this variety of experience we've gained the ability and "know-how" to produce the *right* gear for any job you might have.

SPUR
WORM
INTERNAL
SPIRAL BEVEL
HELICAL
HERRINGBONE
*CONIFLEX BEVEL
SPLINE SHAFT

*Reg. U. S. Pat. Off.



THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

PILLOW BLOCKS
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Shafer Bearing Div., Chain Belt Co., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, BRASS AND COPPER
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE STEEL
Alleghany Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

PLANER ATTACHMENTS
Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

PLANERS, Double Housing and Openside
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTIC AND PLASTIC PRODUCTS
Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PLATE ROLLS
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Surface
Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

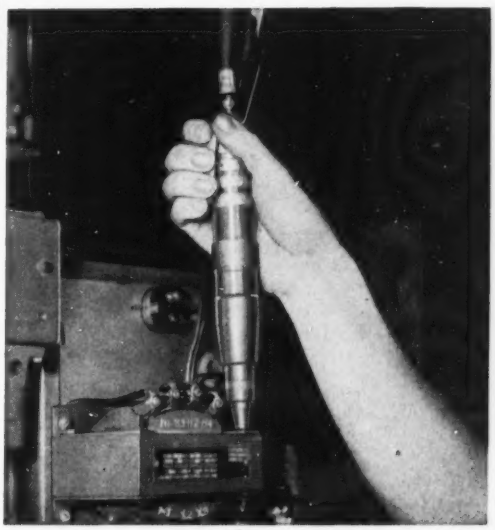
(*Continued on page* 412)

(For more information on products advertised, use Inquiry Card page 245)



Quick cure

for a production line headache



—A NEW AIR SCREWDRIVER THAT'S REALLY QUIET

Replace your present screwdrivers with Chicago Pneumatic's new CP-3008 – the really quiet, air screwdriver. Its supersonic exhaust feature changes sound waves to a frequency which approaches the limit of human hearing.

The rugged, all-steel CP-3008 weighs only 1 lb., 14 oz. . . . has a side outlet exhaust deflector that rotates and locks in any position for directional exhaust. Built-in speed control assures precision speed increases and decreases. Also has a simple, adjustable clutch. Available with many accessories, the CP-3008 has a rated range of #4, #6 and #8 screws but in some cases can be used on #2's and #10's. Write for Bulletin SP-3096. *Chicago Pneumatic Tool Co., 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

(For more information on products advertised, use Inquiry Card page 245)

PNEUMATIC EQUIPMENT

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., Penna. Ave., Towson, Md.
Gardner Machine Co., (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

POLISHING TOOLS, Portable

Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Jarvis, Charles L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads.

PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

PRESSES, Arbor

Bellows Co., 230 W. Market St., Akron, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Die Tryout

Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St. Chicago 38, Ill.
Clifton Hydraulic Press Co., Clifton, N. J.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, (Hydraulic) 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILE—TRACING ATTACHMENTS

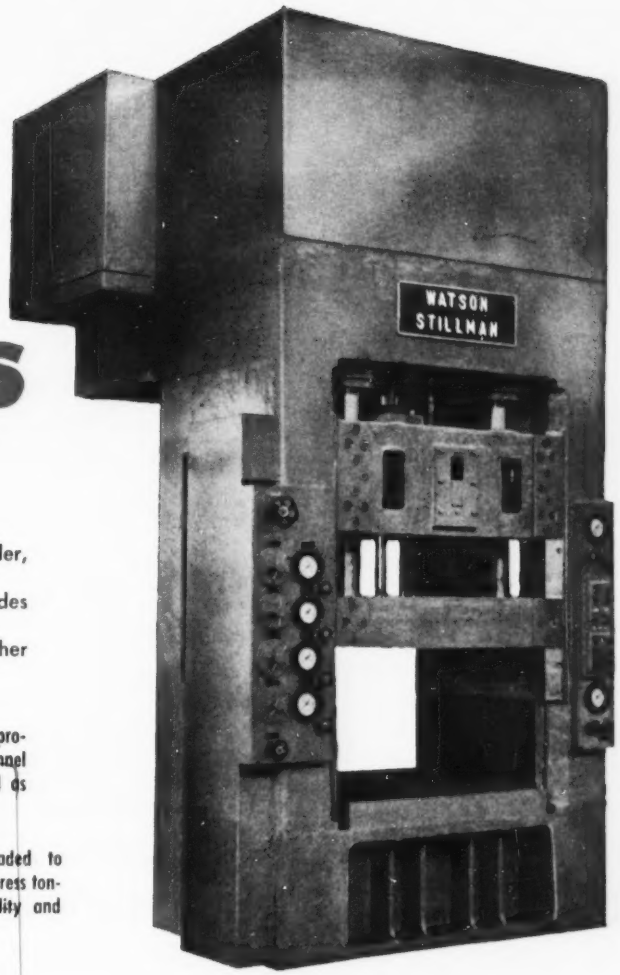
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe)

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc. (and affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pines Engineering Co., Inc., Aurora, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

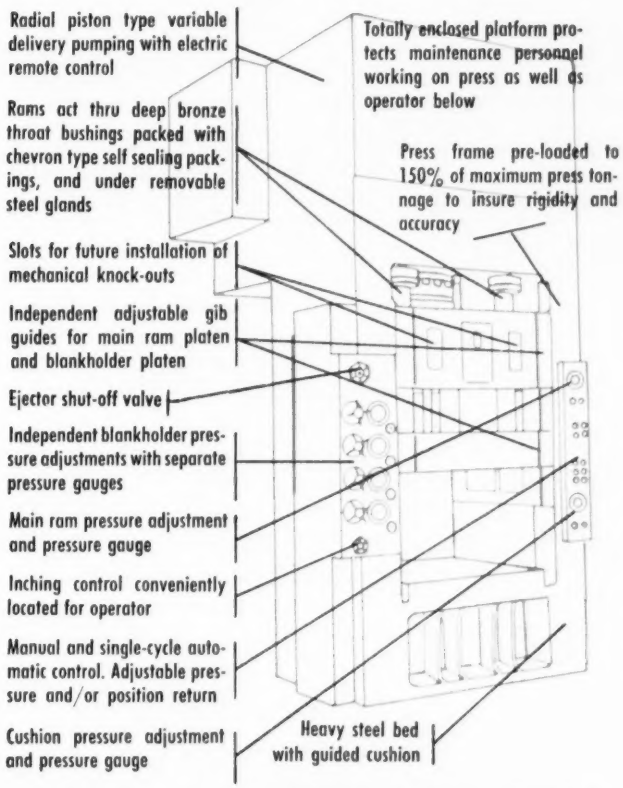
(*Continued on page* 414)

FOR YOUR HIGH-SPEED DRAW JOBS



These features tell the story –

- Adjustable Pressure and stroke on main ram, blankholder, and cushion.
- Main ram pressure and/or position reversal provides maximum protection to press and dies.
- Main platen and blankholder platen can be tied together for single action operation.



The *WATSON-STILLMAN* 450 Ton Double-action Press

Here is versatility, rugged, trouble-free construction, economy of operation and safety all in one press.

Why don't you cash in on the century-old experience of Watson-Stillman engineering . . . write or call our representative in your area. You'll be years . . . and dollars . . . ahead when you do!

EST. W-S HYDRAULIC 1848

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

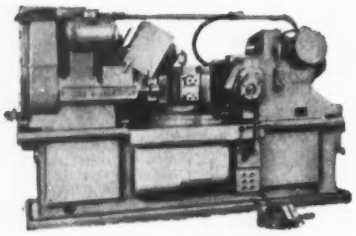
161 ALDENE RD., ROSELLE, NEW JERSEY

9063

W-S "Completeline" Hydraulics... The Shortest Distance From Production to Profits

(For more information on products advertised, use Inquiry Card page 245)





GOSS and DE LEEUW
CHUCKING
MACHINE

When any of the various functions for which this machine is designed are performed on it, no further machining is required. The job is finished.

The basic "1-2-3" method—exclusive with Goss & DeLeeuw—provides for gripping work in the chuck and machining all ends either simultaneously or in sequence. By eliminating several handlings and set-ups, the "1-2-3" method produces finished pieces at a fraction of the time and cost ordinarily required.



Send samples of your work for time estimates. Ask for illustrated literature containing detailed information.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

PULLEYS
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch
Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Thor Power Tool Co., Aurora, Ill.

PUMPS, Rotary
Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago, 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

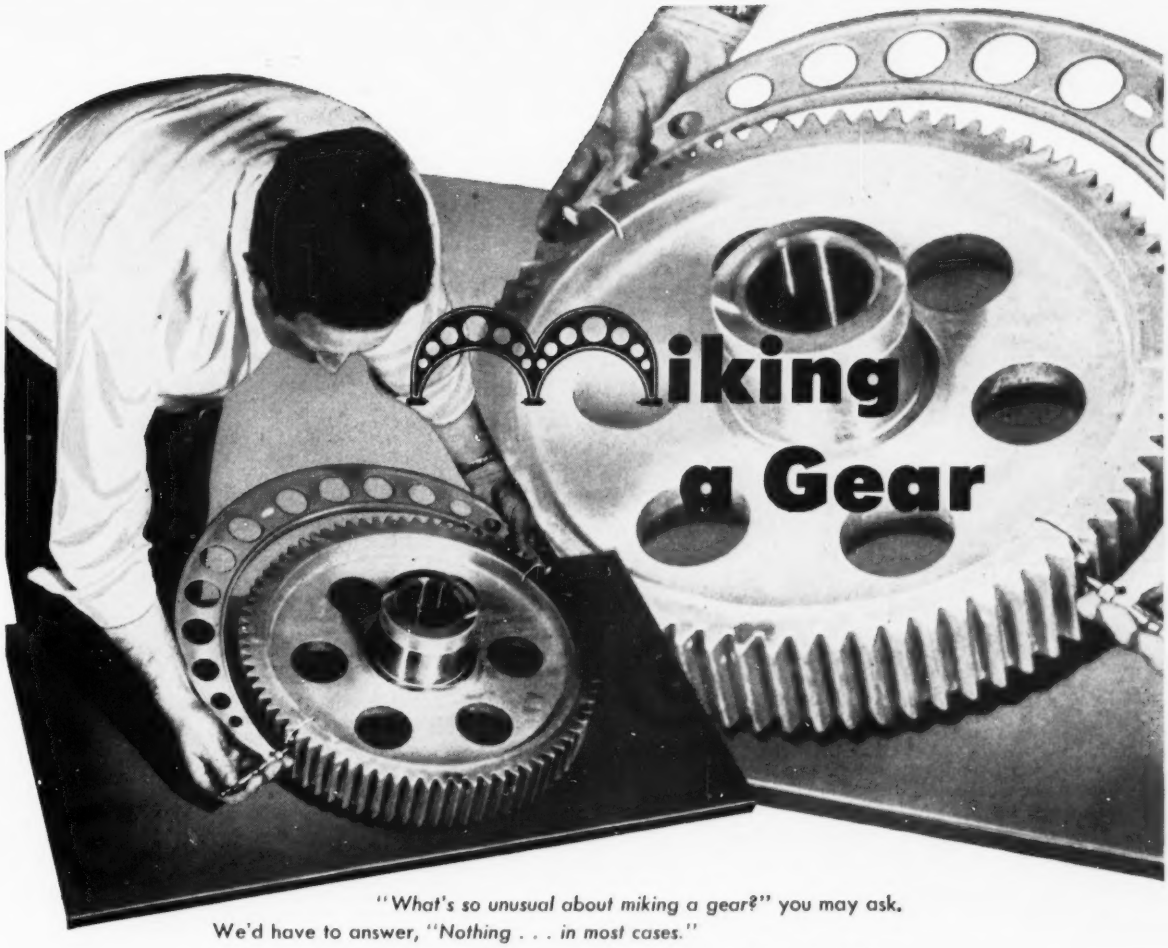
PUNCHES AND DIES
See Dies, Sheet Metal, Etc.

PUNCHES, Centering
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

(*Continued on page* 416)

(For more information on products advertised, use Inquiry Card page 245)



"What's so unusual about miking a gear?" you may ask.
We'd have to answer, *"Nothing . . . in most cases."*

• But when we talk about miking the pitch diameter over wires, of a big case hardened spur gear which must have a Rockwell hardness of 60, and be held to a very close tolerance, we get down to the finer art of gear making.

• BRAD FOOTE has made tens of thousands of the gear illustrated above, on a long contract run. They are subject to rigid customer inspections, and the percentage of acceptance is exceptionally high. Because of few rejections, production costs are lower. So are the costs to the customer.

• Making gears today is no ordinary job. It's a highly specialized business with new techniques that far outdistance methods used only yesterday. Many of these techniques leave no mark visible to the eye when the gear is first examined. But as the service life increases, the value of modern methods becomes apparent.

• Here at BRAD FOOTE we employ every new technique and modern method that has been proved to increase the life of the widely diversified gears, gearmotors, reducers, and transmissions which we design and manufacture. That's why you can order from us with confidence that our products will serve well in your shop or plants, or on the equipment you make for others.

• Avail yourself of the complete facilities and services offered only by BRAD FOOTE. Send your specifications for quotations, or tell us about the job and let us design what you need.



BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700

subsidiaries

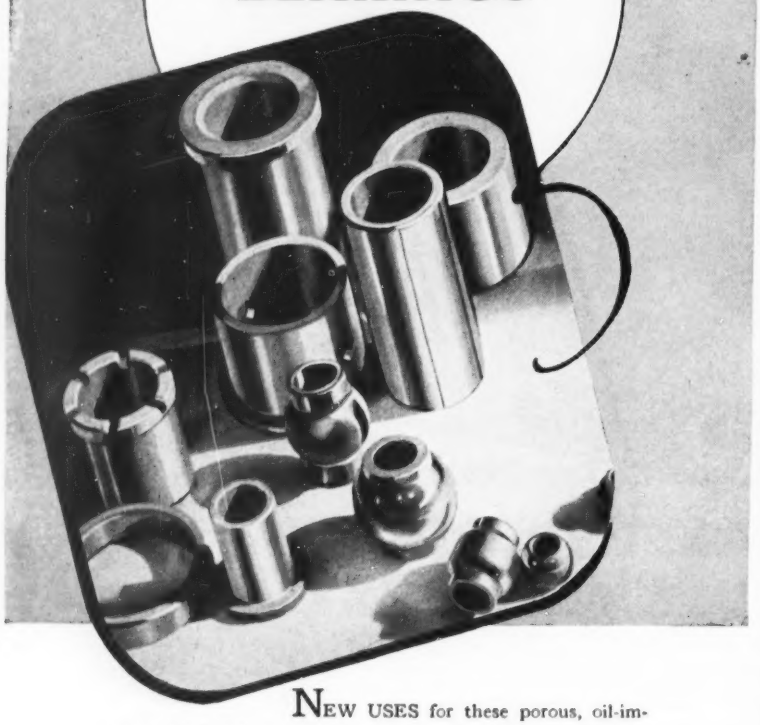
AMERICAN GEAR & MFG. CO.
Phone: Lemont 920
Lemont, Illinois

PITTSBURGH GEAR COMPANY
Phone: ATlantic 1-9950
Pittsburgh 22, Pennsylvania

(For more information on products advertised, use Inquiry Card page 245)

POSSIBLY YOU, TOO, CAN USE LOW COST

Self-
LUBRICATING
JOHNSON
Ledaloyl
BEARINGS



NEW USES for these porous, oil-impregnated bearings are being discovered every month. They answer the long-felt need in applications where it is difficult or impossible to supply adequate lubrication. They may even be sealed in place. Johnson Ledaloyl Bearings can be used, too, for their low cost in many applications where heavy duty service is not a factor. Being molded under high pressure from powdered metal, they are much lower in cost than machined bearings, particularly in odd-shaped, flanged and self-aligning designs, and in large quantities of a size. You, too, may find practical uses for them and benefit from substantial savings.

JOHNSON engineers are glad to assist you in determining whether you can use Ledaloyl bearings to your advantage. Write today!

Ledaloyl BRONZE

Johnson Bronze
SLEEVE BEARING HEADQUARTERS
520 SOUTH MILL STREET • NEW CASTLE, PA.

Famco Machine Tool Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

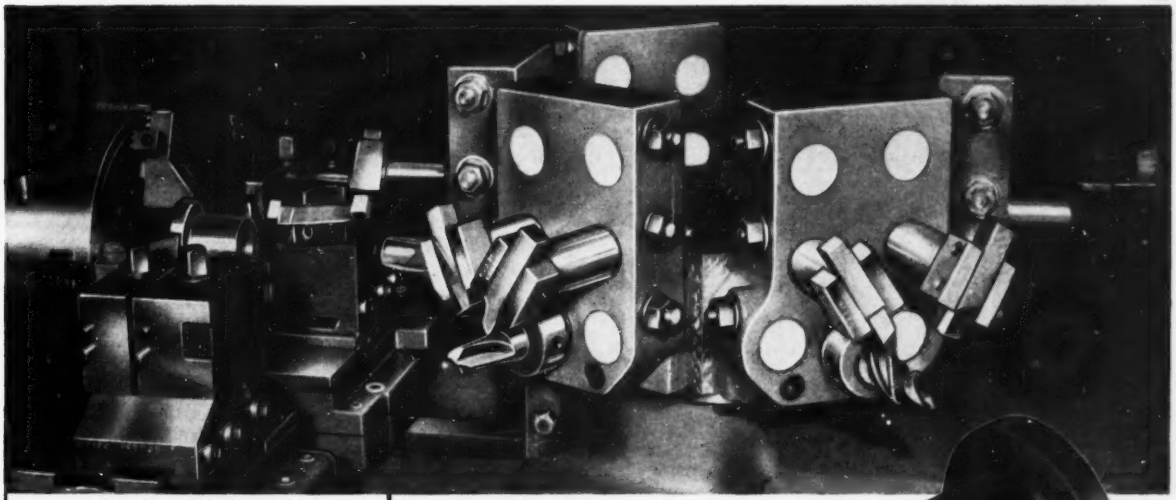
REAMERS, Adjustable

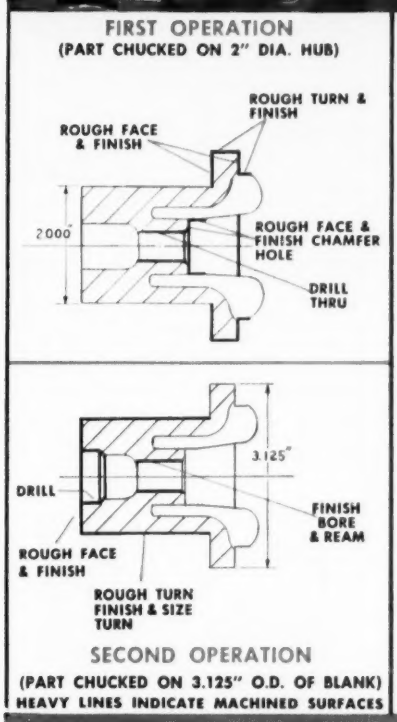
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

(*Continued on page* 418)

(For more information on products advertised, use Inquiry Card page 245)

FINISHED in ONE TURRET CYCLE in 2.66 MINUTES with a 3U SPEED-FLEX AUTOMATIC TURRET LATHE Plus P & J TOOLING







GREY IRON CASTING

When faced with machining jobs like this, call on P&J Tooling Engineers. With the P&J 3U Speed-Flex, and carbide cutting tools, 20 pieces per hour are produced. All operations are automatic, one operator easily handles several machines, and labor costs go down.

This automatic turret lathe has the versatility of spindle speeds from 73 to 1445 rpm, is equipped with four automatic speed changes and three automatic feed changes for each set of pick off gears, six turret faces, a means for operating a slide tool on the turret, and two cross slides that work independently or simultaneously.

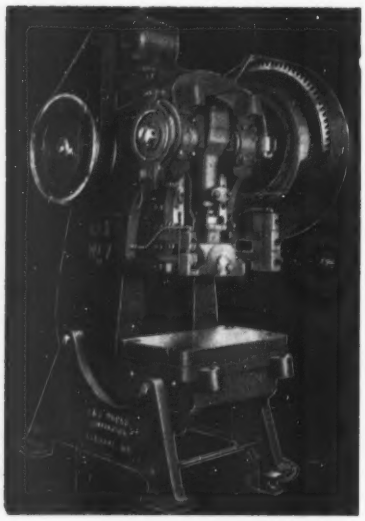
When versatility, automatic operation and multiple work surfaces are combined with P&J special Tooling Service, better pieces at lower costs result. Your operators will like the Model 3U with its spindle speed selector and push button controls.



STILL WANT PROOF? Just submit sample parts and prints for tooling recommendations including time estimates for comparison. Also ask for Bulletin 145.

POTTER & JOHNSTON Co.
PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
PRATT & WHITNEY
DIVISION NILES - BEMENT - POND COMPANY

WRITE DIRECT OR CONTACT YOUR NEAREST PRATT & WHITNEY BRANCH OFFICE
BIRMINGHAM • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DETROIT
LOS ANGELES • NEW YORK • PHILADELPHIA
PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., PAWTUCKET, R. I.
AGENTS: DALLAS, THE STANCO CO., HOUSTON, WESSENDORFF, NELMS & CO.



L&J PRESSES

MORE PRODUCTIVITY AT LOWER COSTS

The accuracy and productivity of an L & J No. 7 Press plus the advantages of an L & J Fawick Air Clutch* give you an ideal combination for reducing costs and improving the quality of your press work.

This dependable combination permits maximum practical speeds plus greater safety and shock-free, full-power operation. Selective controls include inching, single stroke and continuous running. The L & J Air-Release Spring-Set Brake sets automatically if air pressure fails.

It will pay you to find out the advantages this 80 ton press has to offer. Also, 11 other back geared and plain flywheel models starting at 6 tons.

Write for literature.

*Trouble-free because of no end thrust, no springs, no keys and no shifting parts. Pneumatic clutch element on the flywheel constricts to grip the drum on the crankshaft flange.

L&J PRESS CORPORATION
1631 STERLING AVENUE
ELKHART, INDIANA

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

REELS, Stock, Standard and Automatic
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORIES, Heat-Treating Furnace
Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

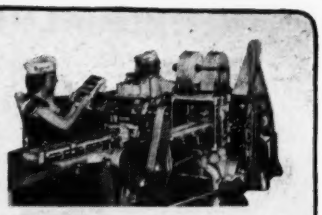
RETAINING RINGS FOR BEARINGS, Etc.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

RIVET SETS
Bethlehem Steel Co., Bethlehem, Pa.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Peck, Stow & Wilcox Co., Southington, Conn.
Thor Power Tool Co., Aurora, Ill.

RIVETERS, Hydraulic
Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

(*Continued on page* 420)



"THIS LUBRICANT REDUCES SERVICE CALLS"

—says LYNCH CORPORATION
Toledo, Ohio

"LUBRIPLATE greatly reduces unnecessary wear and prolongs the life of machines. It has reduced customer calls for service to a minimum. Our Service Engineers can readily spot machines that have had other than LUBRIPLATE Lubrication, as these machines do not give the service they should."

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.



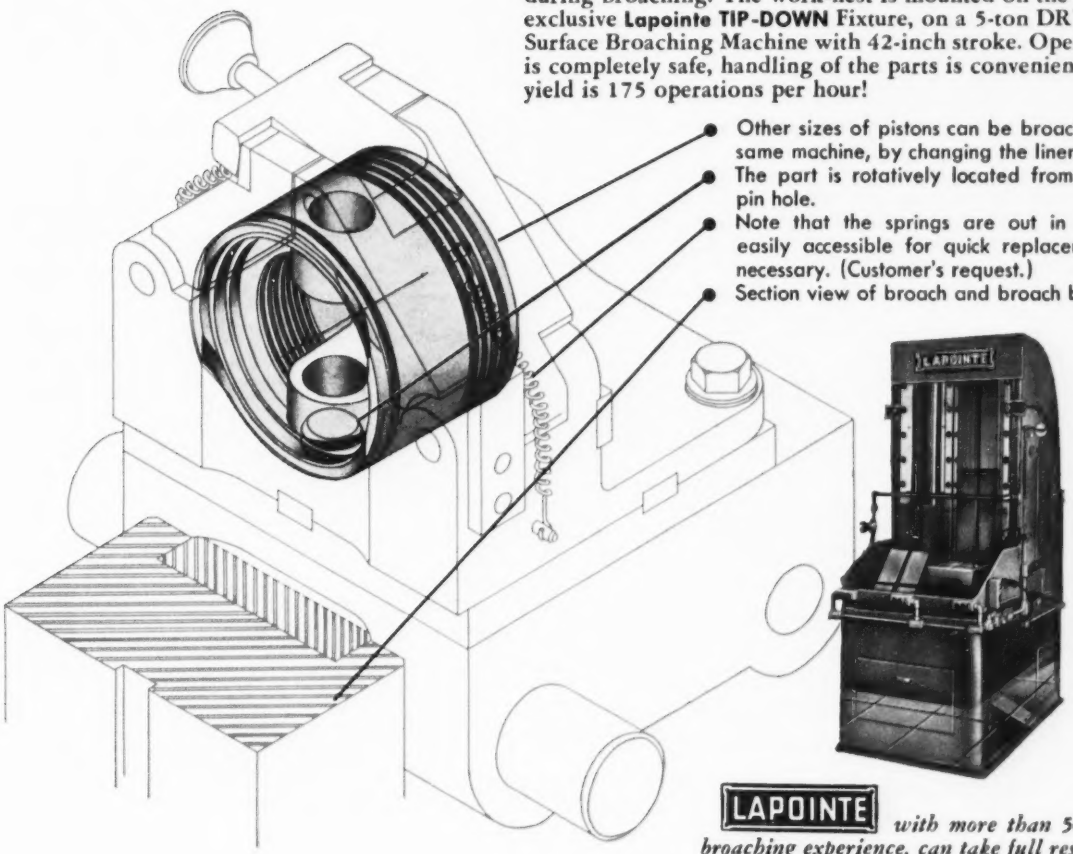
(For more information on products advertised, use Inquiry Card page 245)

LAPOINTE SURFACE BROACHING

. . . the most economical method of metal removal for high production!

This piston is a good example of what can be done by **LAPOINTE** surface broaching. A "contour cut" is broached crosswise, across the end . . . with the piston firmly held in a fixture of unique Lapointe design.

We call it a shroud. Our engineers developed this quick-acting fixture to encompass the part and prevent distortion during broaching. The work-nest is mounted on the exclusive **Lapointe TIP-DOWN** Fixture, on a 5-ton DRV Surface Broaching Machine with 42-inch stroke. Operation is completely safe, handling of the parts is convenient, yield is 175 operations per hour!



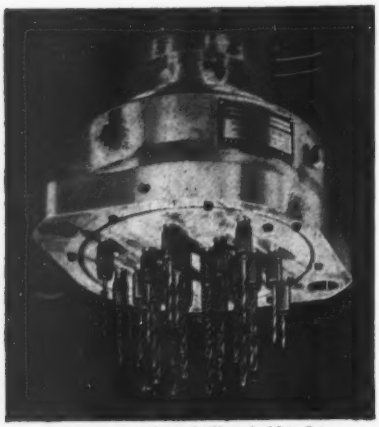
LAPOINTE *with more than 50 years of broaching experience, can take full responsibility for designing and building the machines, tools and fixtures to suit your requirements. For information,*

write for Bulletin **DRV-1**

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

(For more information on products advertised, use Inquiry Card page 245)



Zagar gearless drillhead, 12", 24-spindle, capacity up to 5/8" steel.

Zagar GEARLESS DRILLHEADS *excel* for drilling on close centers

Their unique features have earned for Zagar gearless drillheads a permanent place in many industries. Examples: gas burners, acoustical tile, parts for aircraft (jet engines), business machines, electrical appliances, automotive and farm machinery; drilling cast iron, stainless steel, paper, fiber glass, magnesium, aluminum, brass and copper.

Why this versatility? Because Zagar gearless drillheads (1) can drill practically any number of holes at one pass, up to 600 or more; (2) can drill any material; (3) can drill in any pattern; (4) can "come down to" distances between holes as small as twice the drill diameter; (5) can and do maintain accurate spacing. High production thus combines with complete accuracy to deliver more work and more acceptable work in less time than ever before. Zagar gearless drillheads can be furnished as complete units or can be adapted to any standard drill press. Your parts drawings and full data will bring you a prompt quotation.

Write for Engineering Manual "M-10" for more information on Zagar's tools for industry.

ZAGAR TOOL, INC.
24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Thor Power Tool Co., Aurora, Ill.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment

SANDERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburgh, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio. Portable Electric.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES

Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Thor Power Tool Co., Aurora, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting

Alina Corp., 401 Broadway, New York 13, N. Y. (Portable.)
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Ohio.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

(Continued on page 422)

(For more information on products advertised, use Inquiry Card page 245)



Select the Right Drill for Non-Ferrous Metals

from the W&B Complete Line

If you are production drilling non-ferrous metals, efficiency requires selection of proper speeds, feeds, and most of all, drills specifically applicable to the material. From the complete line of W & B drills you can select a drill for each non-ferrous metal, that is carefully designed to increase production and lower your cost per hole.

A typical W & B non-ferrous drill is the "Fastwist" type, which is recommended for high speed drilling of aluminum, magnesium, zinc, other die cast metals and metals of low tensile strength. For maximum results on individual non-ferrous drilling applications it will pay you to investigate the W & B drill designs available.



Write today on your letterhead for a free copy of the new catalog covering the complete line of W & B Drills, Reamers, Countersinks, Counterbores, Carbide Tools, Tool Bits and Special Tools.

W&B

DRILLS
REAMERS
COUNTERBORES
COUNTERSINKS
CARBIDE TOOLS
TOOL BITS
SPECIAL TOOLS

Contact your local W&B Distributor.

"Makers of Fine Tools Since 1848"

WHITMAN & BARNES

PLYMOUTH, MICHIGAN

NEW YORK • CHICAGO • LOS ANGELES • HOUSTON

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

SCREW DRIVING AND NUT SETTING EQUIPMENT
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Thor Power Tool Co., Aurora, Ill.

SCREW MACHINE TOOLS AND EQUIPMENT
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Eastern Mch. Screw Corp., New Haven, Conn.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave., and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand
See also Lathes, Turret
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp, Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Set Screw & Mfg. Co., 35 Main St., Bartlett, Ill.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-tapping, Drive
Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb
Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

SEALS AND RETAINERS, Oil or Grease
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

SECOND-HAND MACHINERY, Etc.
Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Miles Machinery Co., Box 770, Saginaw, Mich.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifugal
De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant
Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

SHAFTING, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son., Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAFTS
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAFTS, Flexible
Jarvis, Chas. L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

SHAFTS, Hollow-Bored
Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground
Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

(*Continued on page* 424)

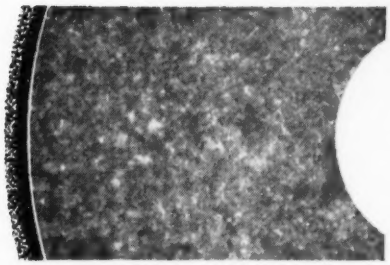


(For more information on products advertised, use Inquiry Card page 245)

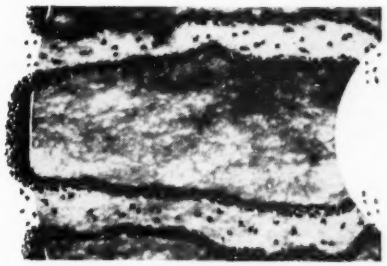
GRADUATED DENSITY

makes MICRO-KLEAN the most effective filter on the market!

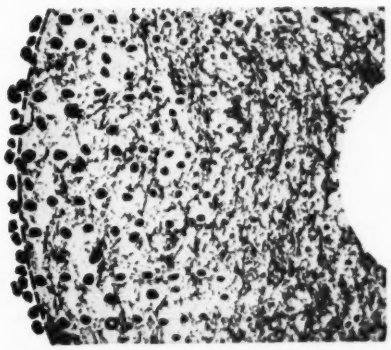
How MICRO-KLEAN compares with other cartridge filters



Compare MICRO-KLEAN with FILTERS WITH THE SAME DENSITY THROUGHOUT. The filter media density is the same on the pressure and discharge surfaces of the element; therefore, dirt accumulation is largely on the outside surface, choking the cartridge ("plastering") and reducing the effective filter life.



Compare MICRO-KLEAN with FILTERS WITH HAPHAZARD DISTRIBUTION OF FILTER MEDIA. Uneven haphazard media density permits fluid to find channels through the filter, and pass solids larger than the minimum filter spacing.



Now Look at the advantages offered by MICRO-KLEAN. See how the fibre density increases toward the discharge side of the MICRO-KLEAN filter cartridge? In effect, every Cuno MICRO-KLEAN cartridge is an infinite multiplicity of screens, ranging from relatively coarse on the outside down to 10 microns in the center. Because of MICRO-KLEAN's graduated density in depth, particles are entrapped within the entire depth of the filter element, giving the cartridge a much longer effective life. Standard cartridge size is 9¾" long by 2¾" O. D., in densities of 10, 25 and 50 microns.

MICRO-KLEAN gives you

- **greater dirt holding capacity**
- **absolute protection against rupturing or channeling of the cartridge**
- **longer effective cartridge life**

REMEMBER . . . IF YOU CAN PUMP IT, CUNO CAN FILTER IT

M.3.C

CUNO **ENGINEERED FILTRATION**
Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

(For more information on products advertised, use Inquiry Card page 245)

COMPACT, FULL-FLOW FILTRATION FOR INDUSTRIAL FLUIDS

Fewer Cartridge Changes Necessary with MICRO-KLEAN filters

You don't need a complicated, bulky filter to keep contaminants out of your chemicals, water, lube or fuel oils. Cuno MICRO-KLEAN's compact construction gives you full-flow filtration in space which would limit ordinary filters to by-pass service.

The high porosity and low pressure drop operation of MICRO-KLEAN filters permit this full-flow service on gravity, low pressure, or suction lines—with no loss in operating efficiency.

Cartridge replacement costs are generally cut in half when MICRO-KLEANS are used. MICRO-KLEAN's graduated density-in-depth provides much greater capacity for dirt accumulation within the micronic cartridge, giving twice the useful life of an ordinary filter element.

Cuno's exclusive method of felting fibres produces a cartridge of great structural strength, free from channeling or distortion and entirely unaffected by moisture or acids. And changing cartridges can be accomplished in a few seconds—only one nut has to be removed.

Send for Cuno's free filtration analysis form, have one of your engineers fill it out, and mail it to us. We'll let you know exactly what you need for your filtration requirements—without obligation. And take advantage of Cuno's unique "money-back" offer. If MICRO-KLEAN doesn't outperform any filter cartridge you have previously used, we'll send you *double* your money back. Send the coupon today for free MICRO-KLEAN bulletin. M.3.5

Cuno Engineering Corporation
Dept. 135-C, South Vine Street, Meriden, Conn.

I'm interested in your "money-back" offer. Please send me your filtration analysis form—and more information on MICRO-KLEAN for

..... (fluid)

Name.....

Company.....

Address.....

City.....Zone....State.....

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hendey Machine Co., Inc., Torrington, Conn.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

SHAPERS, Vertical

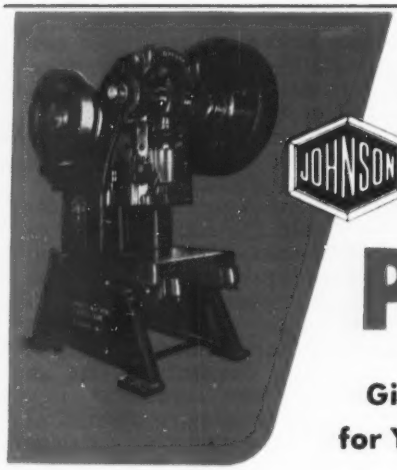
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Cold Drawn Steel

Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div. Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.



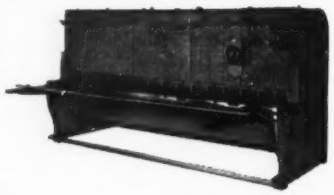
Bonus Built
JOHNSON
POWER PRESSES

Gives You More Service for Your Production Dollar

- Non-Repeating Safety Clutch
- Double Spring Activated
- Unusual Versatility
- Larger Die Space
- Ample Power
- Adaptable to Metals, Plastic, etc.

WRITE FOR SPECIFICATION BULLETIN No. 53

for SPEED POWER ACCURACY
the HYDRA-SHEAR



Will increase your production to a new high. Will shear mild steel up to 10 gauge in three lengths: 6, 8 and 10 feet. Less curl and burring. No gears or clutch.

Johnson MACHINE and PRESS CORP.
620 WEST INDIANA AVENUE • ELKHART, INDIANA

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheriden Rd., Kenosha, Wis.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

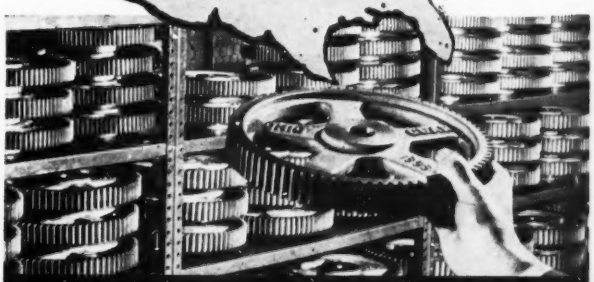
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.

(*Continued on page* 426)

(For more information on products advertised, use Inquiry Card page 245)

STANDARDIZE WITH OHIO

STOCK DISTRIBUTORS



"OFF THE SHELF GEARS and REDUCERS"

You make no mistake when you include an Ohio Gear Distributor in your engineering. You will find he fits into your production plans, and can save you time and money, too! Call him!

DISTRIBUTORS AND REPRESENTATIVES

*Akron 11, Ohio
Hardware & Supply Co.
*Baltimore 2, Md.
L. A. Benson Co., Inc.
*Brooklyn 6, N. Y.
(Gears) Northside Leather Belting Co.
*Buffalo, N.Y.
*S. H. Pooley Belting Co.
F. E. Allen Co.
*Chicago, Ill.
Apex Power Equipment Co.
Schrade-Batterson Co.
*Cincinnati 14, Ohio
Metzger Machine Co.
*Cleveland, Ohio
J. A. Shomer Co.
Ohio Gear Co.
*Detroit 3, Mich.
Abrasive and Supply Co.
*Erie, Penn.
Cohen Industrial Supply
*Findlay, Ohio
Bearing & Transmission Co.
*Grand Rapids 2, Mich.
F. Raniville Co.
*Hagerstown, Md.
Hagerstown Equipment Co., Inc.
*Hoboken, New Jersey
(Gears) Crown Industrial Supply
Houston 3, Texas
Behring's Bearing Service, Inc.
*Indianapolis 2, Ind.
A. R. Young Company, Inc.
*N. Kansas City 16, Missouri
Sesco Engineering & Supply Corp.
*Los Angeles 1, Calif.
J. W. Minder Chain & Gear Co.
Louisville 2, Ky.
Alfred Halliday
*Massillon, Ohio
Hardware & Supply Co.
*Memphis 2, Tenn.
Memphis Bearing & Supply Co.
Milwaukee 11, Wisc.
A. F. Korf Co.
*Minneapolis 4, Minn.
Industrial Supply Co., Inc.
*Muskegon, Mich.
Lakeshore Machinery & Supply Co.
New Haven, Conn.
George G. Pragst
*New Orleans, La.
*(Gears) R. J. Tricon Co., Inc.
*(Reducers) Woodward Wight & Co., Ltd.
*New York, N. Y.
*(Reducers) Patron Transmission Co., Inc.
*(Gears) Atlantic Transmission & Gear Sales, Inc.
*Paterson 4, N. J.
(Gears) Bernstein Bros. Inc.
*Philadelphia, Pa.
*Robert L. Latimer Co.
*Rothman Belting & Equipment Co.
*Piqua, Ohio
Bornell Supply Co.
*Pittsburgh 30, Pa.
Standard Machinists Supply Co.
*Portland 14, Oregon
J. W. Minder Chain & Gear Co.
*Rochester 14, N.Y.
H. M. Cross & Son
*San Francisco 3, Calif.
Adam Hill Company
*St. Louis 4, Missouri
The Easmueller Co.
*Syracuse, N. Y.
U. S., Inc.
*Toledo 12, Ohio
G. & J. Bearings & Supply Co.

IN CANADA, *Montreal, Quebec, John Braidwood & Sons, Ltd.
*Stocks Carried.



ESTABLISHED 1915
THE OHIO GEAR COMPANY
1331 EAST 179th STREET • CLEVELAND 10, OHIO

OHIO GEARS



(For more information on products advertised, use Inquiry Card page 245)

production begins with



Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist & Drill Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

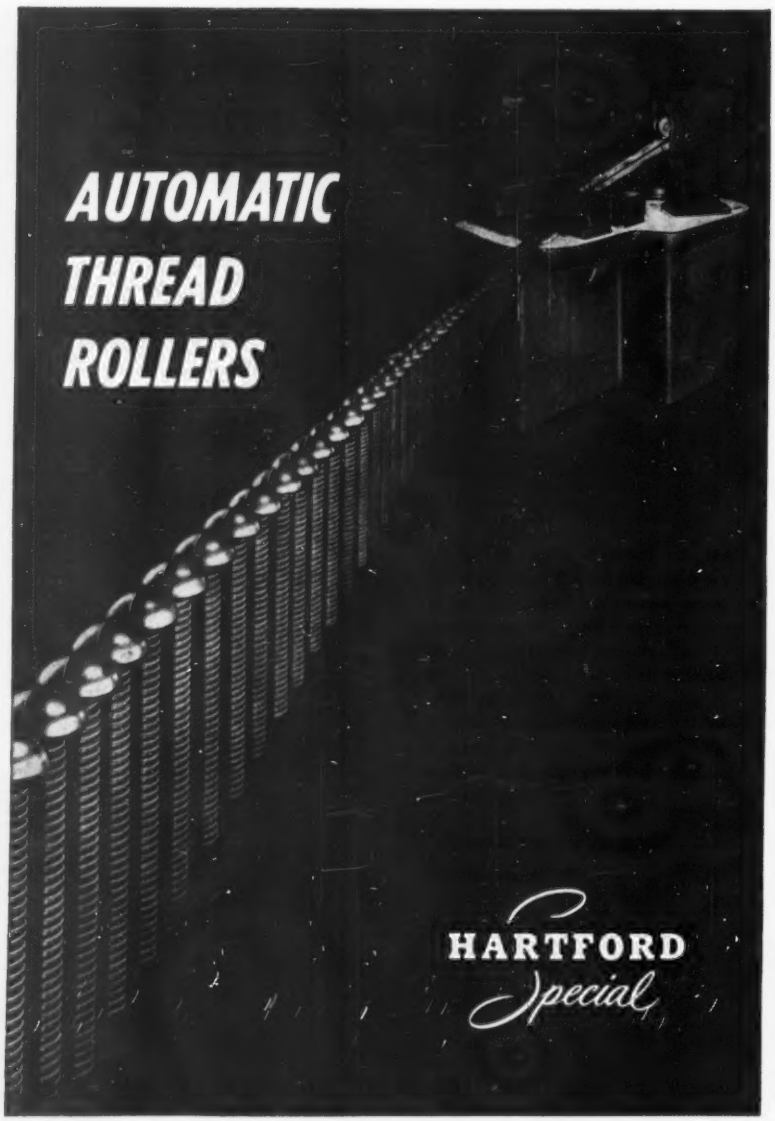
SPECIAL MACHINERY AND TOOLS

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Coulter, James, Machine Co., 619 Railroad Ave., Bridgeport 5, Conn.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jahn, B. Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New England Mch. & Tool Co., Berlin, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

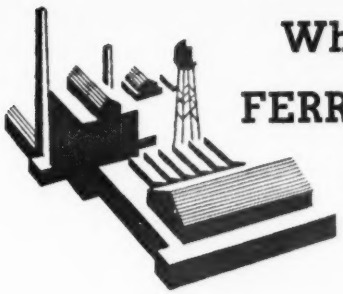
SPEED REDUCERS

Atlantic Gear Works, Inc., 200 Lafayette St., New Cork 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

(Continued on page 428)



(For more information on products advertised, use Inquiry Card page 245)

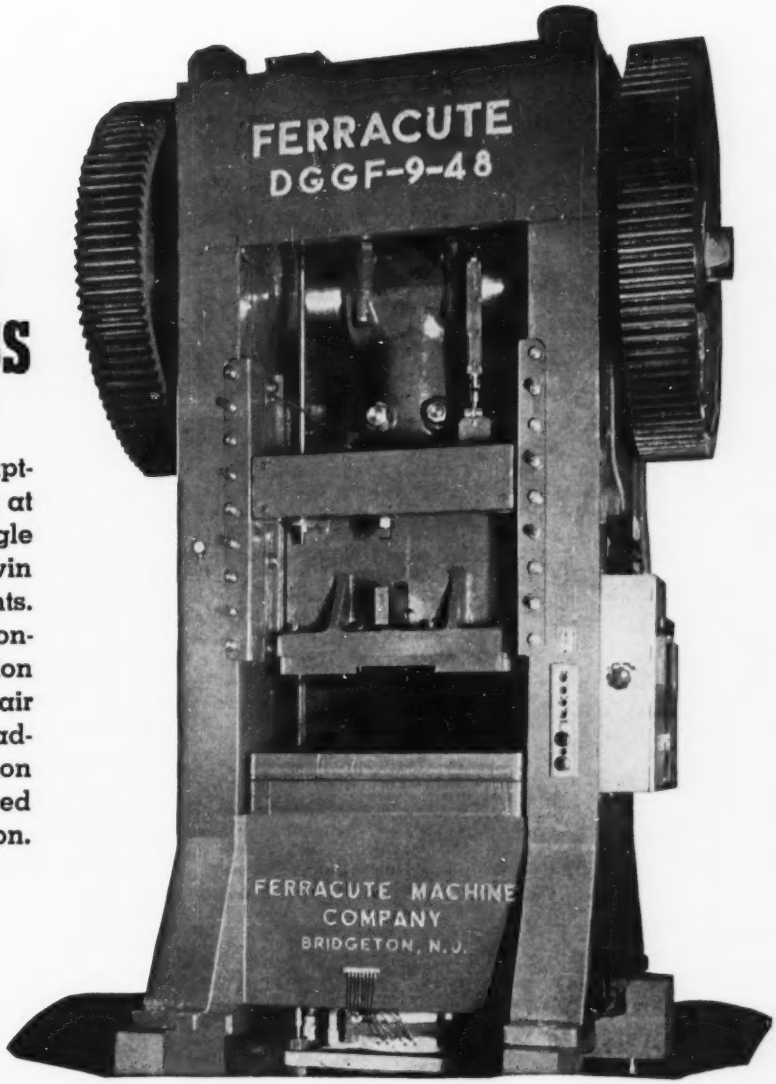


Whatever your press requirements FERRACUTE is in the picture as for example . . .

350-ton BLANKING and DRAWING PRESS

Ferracute No. DGGF-9-48

Highly versatile, highly adaptable. 350-ton press operating at 20 strokes per minute. Single Crank, Double Geared, Twin Driven 48" between uprights. Air operated, electrically controlled, combination friction clutch and brake. Slide, air counterbalanced—motorized adjustment. Automatic lubrication throughout. Controls mounted for convenience of operation. Bed mounted die cushion.



FERRACUTE
Since 1863

MACHINE COMPANY

Manufacturers of Power Presses and Special Machinery • BRIDGETON, NEW JERSEY, U.S.A.

(For more information on products advertised, use Inquiry Card page 245)

Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schnectady, N. Y.
James, D. O. Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.
Mullins Manufacturing Corp., Salem, Ohio.

STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Laminated Shim Co., Inc., Glenbrook, Conn.
Mullins Manufacturing Corp., Salem, Ohio.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STAMPS, Steel and Marking Dies

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co, 208 S. LaSalle t., Chicago 4, Ill.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(*Continued on page* 430)

CUT... OPERATING — MAINTENANCE — SPOILAGE COSTS!

ON YOUR TAPPING JOBS!



Procunier Tappers are the last word in economical, efficient, high speed tapping. More and more manufacturers are realizing that Procunier offers them the solution to their steadily rising production costs on many tapping operations. Only Procunier has the unique construction features that permit inexperienced operators to tap like experts. Procunier Tappers provide many extra hours of continuous, accurate tapping without frequent "down-time" interruptions. Procunier Tappers are producing more — with fewer rejections, fewer spoiled pieces and a minimum of broken taps.

There are many reasons for Procunier's superiority in the tapping industry. Here are just a few of the many remarkable mechanical improvements that only Procunier provides: new sensitive double cone friction clutch; soft cushioned action driving pressure; ballbearing equipped; heat treated gears; special balanced gear reversing mechanism; smaller-lighter more accurate tru-grip tap holder; and many others.

NEW "TRU-GRIP" TAP HOLDER

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

Write for FREE Brochure

Giving full particulars on the complete line of Procunier Tapping Machines. Learn how you can adapt them to your specific needs.



Procunier
Safety Chuck Company
16 S. CLINTON ST. CHICAGO 6, ILL.

PROCUNIER SAFETY CHUCK CO.
16 S. Clinton St., Chicago 6, Ill. Dept. 10

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

Name.....
Address.....
City..... Zone..... State.....

(For more information on products advertised, use Inquiry Card page 245)

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 2)

ONE SOURCE FOR ALL TOOLING NEEDS

THE *RIGHT* STEEL OR CARBIDE . . . THE *EXACT* METALLURGICAL COMBINATION NEEDED TO DO YOUR JOB BEST . . . FROM A SINGLE MANUFACTURING SOURCE

The next time you have a difficult tooling problem we invite you to call in a Firth Sterling man.

He may be called a "tooling specialist" or a "sales engineer" . . . but anyhow he's just a fellow who understands the *cutting*, *shaping* and *forming* of metals like nobody's business. He *may* be a graduate engineer, or he may have learned the hard way on a milling machine, draw bench or press, but he *knows* the score.

He can give you an unbiased recommendation . . . because he has approximately 100 different grades of Firth Sterling high speed steels, and tool and die steels to choose from *and* a dozen grades of tungsten carbide in everything from die nibs to a virtually unlimited variety of standard and special carbide cutting tools and tips.

All this is backed by 64 years of leadership in the development and production of special purpose steels, and 24 years of pioneering in carbide and "powder metallurgy" applications.

It makes sense, that a company which engages in *all* phases of tooling metallurgy will serve your interests best.

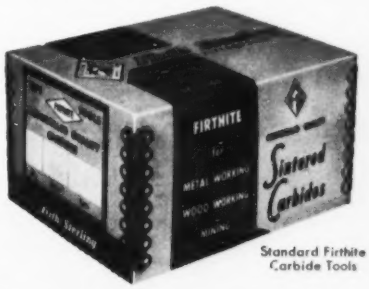
Remember, Firth Sterling *is* a single, dependable source for complete shop tooling.

Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future

GET THE FIRTH STERLING "Packaged Line"

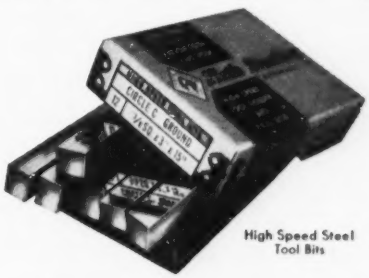
FOR COMPLETE SHOP TOOLING

If they were jewels, instead of tools, they couldn't be packaged with more thought for distributors' and users' needs. Tough, corner-reinforced cardboard or reusable

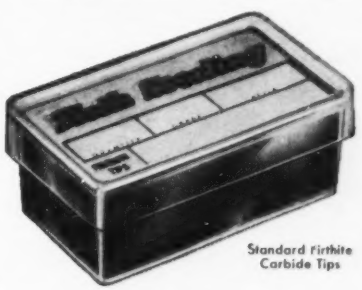


Standard Firthite Carbide Tools

plastic containers for maximum protection. End or top marked with contents for quick, accurate selection. Boxed in standard quantities. Easy to handle,


High Speed Steel Tool Bits

stock, identify, inventory. Yes, the Firth Sterling packaged tool line has these advantages for distributor and user alike.


Standard Firthite Carbide Tips

But more, both high speed *steel* and Firthite *carbide* tools are available, to assure choice of the right tools for every job . . . from stock, from *one* dependable source!

Firth Sterling

—INC.—

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OFFICES* AND WAREHOUSES: BIRMINGHAM* CHICAGO CLEVELAND DAYTON* DETROIT HARTFORD HOUSTON* LOS ANGELES NEW YORK* PHILADELPHIA* PITTSBURGH* WASHINGTON*

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

VISIT BOOTH NO. 912, METAL SHOW, CLEVELAND

(For more information on products advertised, use Inquiry Card page 245)

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div. Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel.

STEEL BARS

See Bars, Steel.

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

(*Continued on page* 432)

CLUTCHES by ROCKFORD



This Lathe "Works Both Ends Against The Middle"

The Lodge & Shipley DUOMATIC LATHE features independently actuated front and rear carriages and tool slides; permitting simultaneous or independent operation of the front and rear cycles. ROCKFORD CLUTCHES both drive and brake the main headstock drive. Let ROCKFORD clutch engineers help plan versatile power transmission controls for *your* machines.

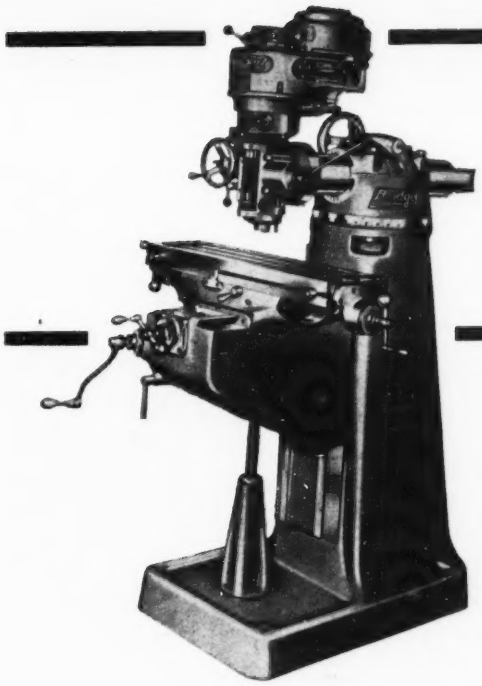
Send for This Handy Bulletin



Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
410 Catherine Street, Rockford, Illinois, U.S.A.

(For more information on products advertised, use Inquiry Card page 245)



Bridgeport

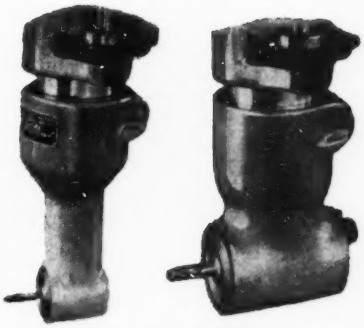
The Machine that mills, drills, bores and shapes at all angles with one set up

DESIGNED, BUILT, KNOWN and ACCEPTED . . . *for today's and tomorrow's requirements*

The BRIDGEPORT TURRET MILLING MACHINE . . . familiarly known in metal working shops as the "Bridgeport Miller" . . . is in a class all by itself in versatility, utility and accuracy. It is not only several machines designed and built into a single unit, but it performs each of its individual functions **equally** well . . . with highest precision.

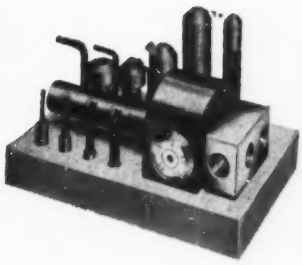
There is never an idle moment for this outstanding machine tool, recognized and accepted as a "must" in the hundreds of modern tool rooms and die shops where it is in daily operation. It is, in fact, the "busiest machine in the shop" because of its capacity to handle repetitive small work on a production basis.

Get all the facts concerning the "BRIDGEPORT" . . . from your nearest dealer or from us direct. Investigate the attachments available.



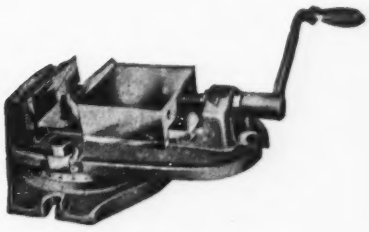
RIGHT ANGLE ATTACHMENTS

(Left) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities. *(Left) Heavy Duty* . . . for milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.



No. 2 BORING HEAD

Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



MILLING MACHINE VISE

An improved vise providing great gripping power. Streamlined for attractiveness; equipped with coolant trough. Rigid holding assured by large diameter screw. Two sizes: 5" x 3½" and 6" x 5" jaw openings.

Get complete information TODAY

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

STUD SETTERS
Errington Mechanical Laboratory Inc. 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES
Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES
Gisholt Machine Co., 1245 E. Washington Ave. Madison 10, Wis.

SURFACE PLATES
See Plates, Surface

SWAGING MACHINES
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Centrol Products, Inc., (Waterproof and Thermo), 306 Sussex St., Harrison, N. J.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

TACHOMETERS
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard
Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Chicago Screw Co., Bellwood, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

TAPPING ATTACHMENTS AND DEVICES
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Homestrand, Inc., Larchmont, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thrifimaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES
Associated Mch. Tool Corp., P. O. Box 9666, 535 McNeilly Rd., Pittsburgh 26, Pa.
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barries, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Machine Co., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jarvis, Chas. L., Co., Middletown, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

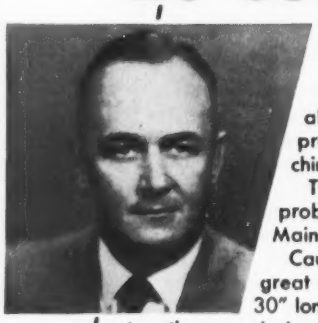
TAPPING MACHINES, Nut
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS
Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O. Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mach. Co. New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

(*Continued on page* 434)

he sets 'em up...



for speed and accuracy!

Erickson field engineers, like Dick Butts above, are trained to get the utmost in production and accuracy from your machine tools.

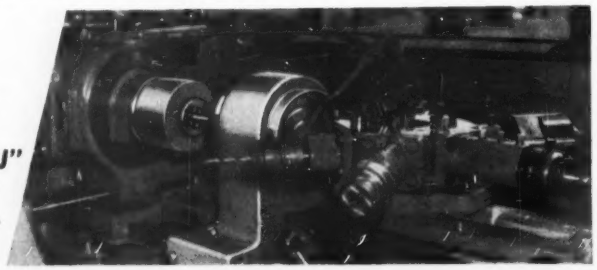
Typical is the solution to a "precision" problem at Saco-Lowell Shops of Biddeford, Maine . . . manufacturers of textile machinery. Cause of lost accuracy was an unusually great diameter-to-length ratio on rolls 24" to 30" long. They must fit perfectly when threaded together on spinning frames up to 52' long. Machining consists of drilling, reaming, and tapping to a .004" TIR from thread P.D. to roll O.D.

Accuracy is now rigidly held by use of Erickson Speed Chucks as both headstock and steady-rest. A report from Saco-Lowell states:

"By use of Erickson chucks on both spindle and auxiliary support, we increase quality, reduce handling time and reduce set-up time when changing to other sizes."

Erickson's technical staff can develop the correct solution to your tool and work holding problems.

Write for Catalog "J" Today

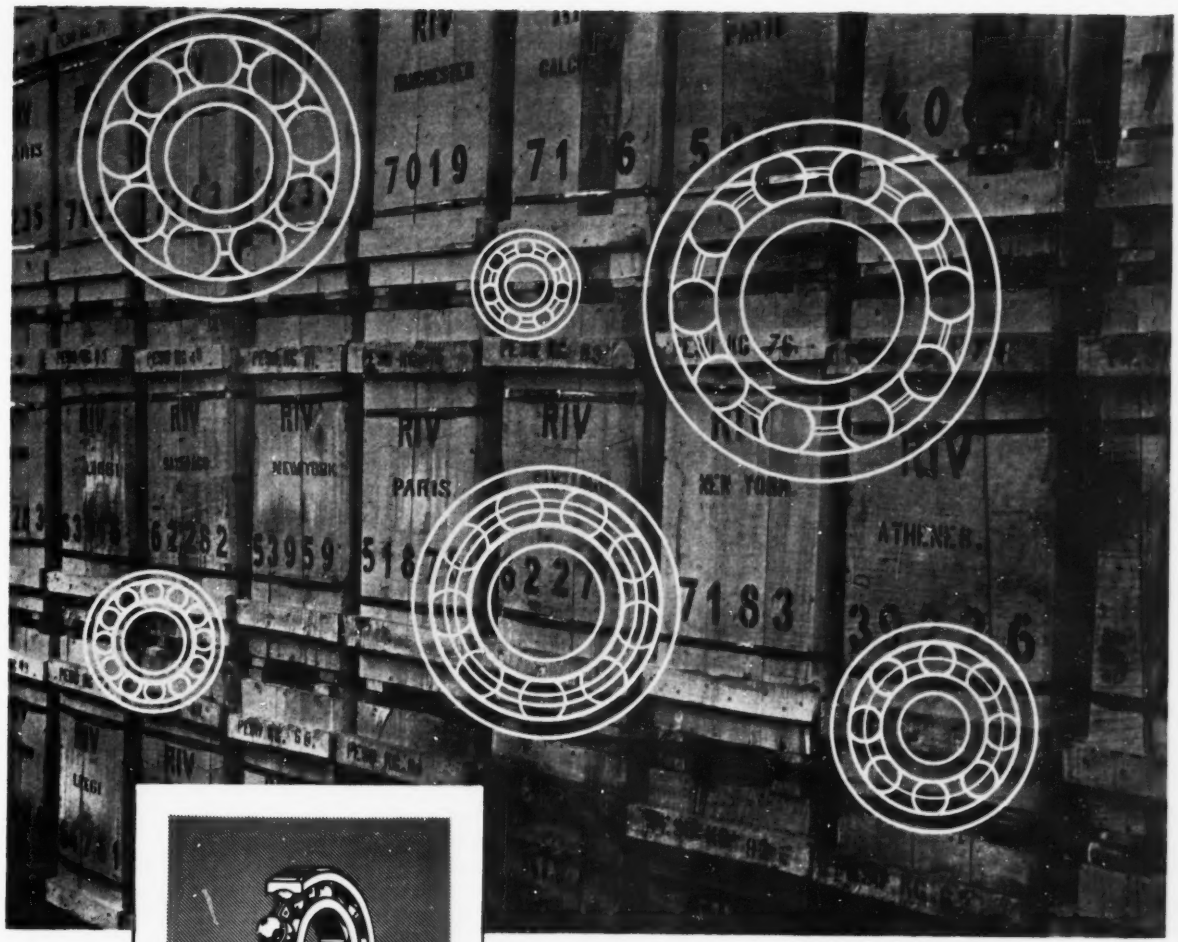


ERICKSON TOOL COMPANY

2319 M HAMILTON AVE. • CLEVELAND 14, OHIO

COLLET CHUCKS . TAP CHUCKS FLOATING HOLDERS
EXPANDING MANDRELS . AIR CHUCKS . SPEED INDEXERS

(For more information on products advertised, use Inquiry Card page 245)


RIV
7019
71
PARIS
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THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Coulter, James, Machine Co., 629 Railroad Ave., Bridgeport 5, Conn.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N.Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Coulter, James, Machine Co., 629 Railroad Ave., Bridgeport 5, Conn.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich.
V & O Press Co., Div., Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div. Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planning Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

(*Continued on page* 436)



Does this PRESS-RITE 30 TON POWER PRESS FIT YOUR REQUIREMENTS?

SPECIFICATIONS	No. 3-30 TON
Diameter of Crankshaft a Bearing and Pin	3"–4"
Standard Stroke	2 1/2"
Longer Stroke at Extra Charge, Maximum	4"
Distance Bed to Slide, Stroke Down, Adjustment up	10"
Bolster Area—F.B. x R.L.	13 3/4" x 23 3/4"
Distance to Back from Center of Slide. or Depth or Throat	7"
Opening in Back	11"
Diameter of Hole in Slide for Die Shank	2" Round
Flywheel Speed, R.P.M.	120
Motor Required	3 HP 1140 RPM
Floor Space Required, Floor Model	35" x 38"

MORE OF THE PRESS FEATURES YOU WANT

Typical of the Press-Rite line, you will find more features in a single press that help you keep production at a high level with a minimum of maintenance, and set-up time. Bronze bushed main bearings, greater die space, rugged actuated brake, single stroke safety mechanism, and 4 point drive ring are standard on all models. Air clutch is also available at extra cost.

FREE ENGINEERING SERVICE

Send in your specs or a sample part for our experienced engineers' recommendations. It assures you of the right press for your job, and there is no obligation on your part.
Let us mail you this Press-Rite catalog. Complete specifications on all models.

A COMPLETE LINE . . . FROM 5 TO 85 TONS

This 30 ton Press-Rite Inclinable Power Press may fit your job to a "T" . . . or may require a smaller or larger unit. Whatever your needs, Press-Rite is your best buy!

Sales Service Machine Tool Co. SSMT
PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS
2351 UNIVERSITY AVENUE • ST. PAUL 4, MINNESOTA

(For more information on products advertised, use Inquiry Card page 245)

STEP-UP Your Light Precision Machining with LIGHT TEN LATHES

Here is a whole series of small lathes designed and built to do your light precision machining. All have the same sturdy construction, the same convenience and ease of operation. There is a choice of 11 models for production, toolroom and maintenance work. Accessories, type of drive, length of bed, and equipment vary. Send for complete catalog and select the lathe which exactly suits your needs.

SPECIFICATIONS

Swing — 10" over bed

Collet Capacity — 5/8" max.

Spindle Bore — 27/32"

Distances Between Centers
Bench models — 16½", 22½", 28½", 34½". Toolroom bench models — 16½", 22½", 28½". Floor Models — 22½".

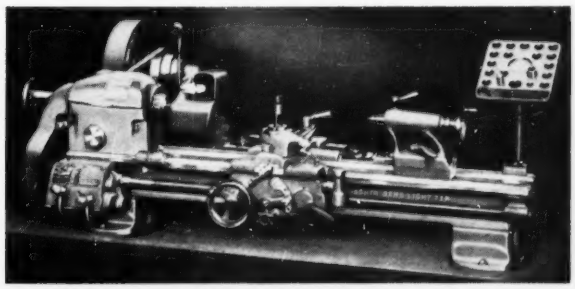
Spindle Speeds (approx.)
12-speed drives — 48 to 1435 r.p.m.
16-speed drives — 52 to 1365 r.p.m.

Power Longitudinal Feeds (R.H. or L.H.) Toolroom and Model A — 48, .0015" to .0853". Model B — 26, .0021" to .0155". Model C — 14, .0021" to .0156".

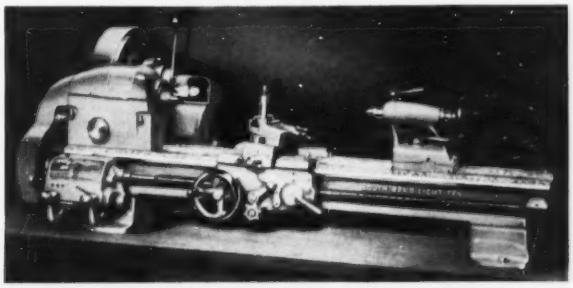
Power Cross Feeds (reversible) Toolroom and Model A — 48, .0004" to .0255". Model B — 23, .0009" to .0046". Cross-feed is hand operated on Model C.



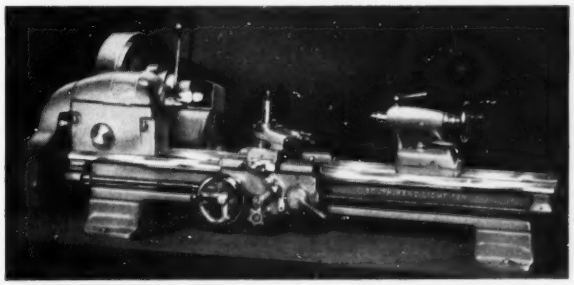
Light Ten Floor Lathe — Model A. 12-speed Underneath Motor Drive — Quick Change Gears. Worm drive apron with power cross-feeds.



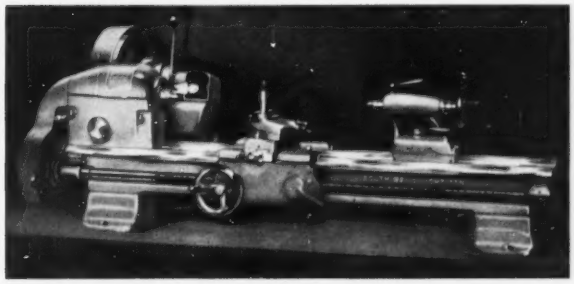
Light Ten Toolroom Precision Bench Lathe. Includes usual toolroom attachments.



Light Ten Bench Lathe — Model A. Quick Change Gears. Worm drive apron with power cross-feeds.



Light Ten Bench Lathe — Model B. Independent Change Gears. Worm drive apron with power cross-feeds.



Light Ten Bench Lathe — Model C. Independent Change Gears. Plain apron with hand operated cross-feed.



Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ 7" BENCH SHAPERS

☐ TOOL GRINDERS

☐ ½" & 1" Collet TURRET LATHES

Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

(For more information on products advertised, use Inquiry Card page 245)

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Lovejoy Tool Co., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Milholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
OK Tool Co., Milford, N. H.
Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 Wheeler St., Springfield, Ohio.

TOOLMAKERS' INSTRUMENTS

mes, B. C., Co., Waltham 54, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

ARTER *Precision*

ROTARY SURFACE GRINDERS
for Jet and Piston Engine Airplane Parts

THE MODEL "A"

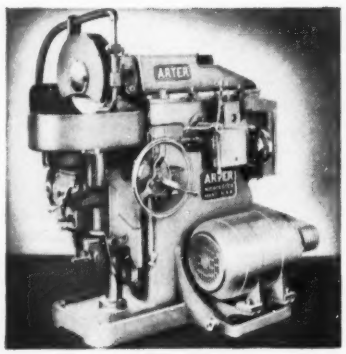
Model "A". Grinding is done on the periphery of the wheel, the work being held by a rotating magnetic chuck. Two sizes: 8" and 12" diameter.

THE MODEL "B"

Model "B". Four chuck capacities — 20", 24", 30" and 40". These machines are mainly hydraulically operated. Great vertical capacity. Work table can be tilted.

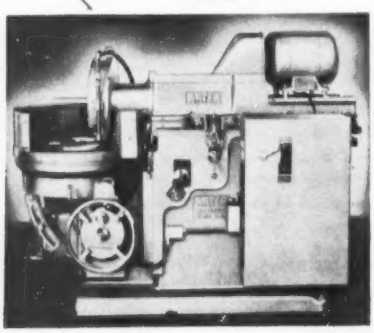
THE MODEL "D"

Model "D" — two chuck capacities — 12" and 16". A 7½ h. p. motor, precision balanced, mounted on the wheel slide delivers full power by multiple vee belts, to the wheel spindle.

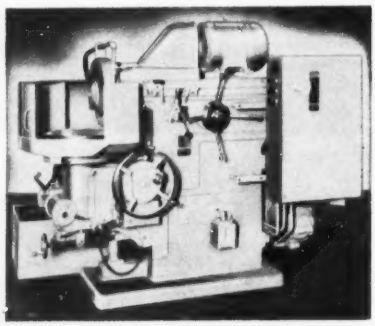


MODEL "A"

MODEL "B"



MODEL "D"



Write today for complete details and specifications

Arter GRINDING MACHINE CO.
WORCESTER 5, MASSACHUSETTS

Rotary Surface Grinders, Flat Circular Cutter Grinders, Internal Grinders, Cylindrical Grinders, Carbide Tool Grinders.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
OK Tool Co., Milford, N. H.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Metal Corp., Lexington, Ky.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Springfield, Vt.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
OK Tool Co., Milford, N. H.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TRANSFER MACHINES, Automatic

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Colonial Broach Co., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland.

TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo 10, Ohio.

TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

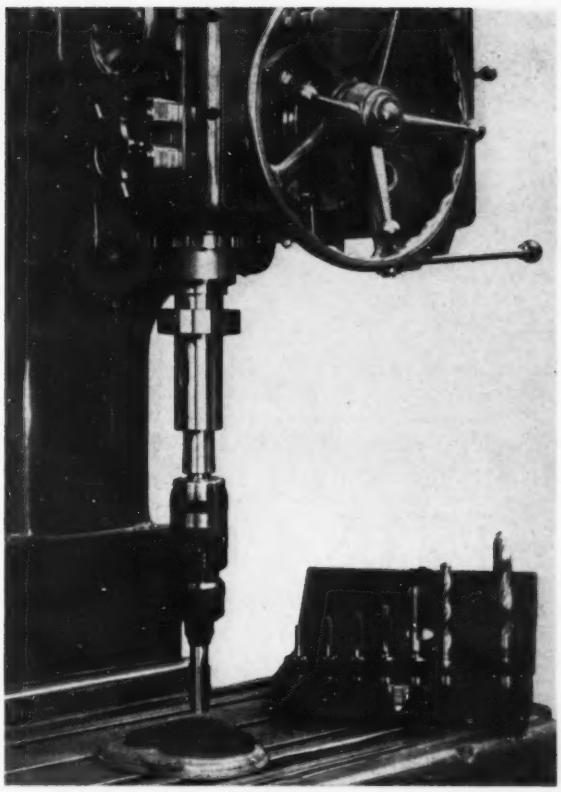
(*Continued on page* 438)

(For more information on products advertised, use Inquiry Card page 245)

The ASQUITH

VARIABLE TORQUE

TAPPER



The problem of setting tapping devices to give the desired degree of safety has become more and more complicated with the increasing variety of materials with which modern drilling machines are called upon to deal.

Even the most skilled operators experience great difficulty in avoiding excessive tap breakage and thread stripping.

THE V. T. TAPPER IS THE ANSWER TO TAPPING PROBLEMS

Simplicity in design, construction setting and operation.
Absolute safety under all conditions, whether through or blind holes.
Rapidity in setting, fixing and tool changing. The unit embodies a built-in quick-change chuck.
Versatility Accommodates drills, reamers, etc., as well as taps with safety and success.
Automaticity When once set for operating on a given material, the slipping load for varying sizes of taps is automatically regulated by the adaptors. Positive drive for drilling and reaming is also applied automatically.
Productivity Cuts out delays due to tool damage. Remains in spindle of machine when changing from tapping to drilling, etc., and vice-versa.

The V. T. Tapping Unit covers the range of tap sizes indicated in the table used in radial drills or any reversing spindle drilling machine.

Size	M.T. Shank	R.H. or L.H. Taps	Drills
1	2 or 3	1/8" to 3/8"	No. 1 M.T. Shanks
2	3 or 4	1/4" to 3/4"	No. 2 M.T. Shanks
3	4	3/8" to 1"	No. 3 M.T. Shanks
3A	4 or 5	3/8" to 1 1/4"	No. 3 M.T. Shanks

DEALER TERRITORIES OPEN

WILLIAM ASQUITH LTD. ARE THE WORLD'S LARGEST BUILDERS OF RADIAL DRILLS

ASSOCIATED MACHINE TOOL CORPORATION

"MACHINE TOOL SPECIALISTS"

P. O. BOX 9666

535 McNeilly Road Pittsburgh 26, Pa.

Please send my free copy of the Asquith Tapper catalog.
Name .....
Position .....
Co. Name .....
Co. Address .....
City ..... Zone .... State .....

(For more information on products advertised, use Inquiry Card page 245)

TUBING, Brass and Copper

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

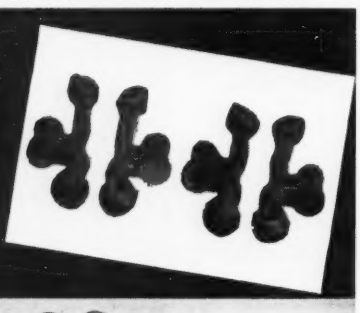
Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

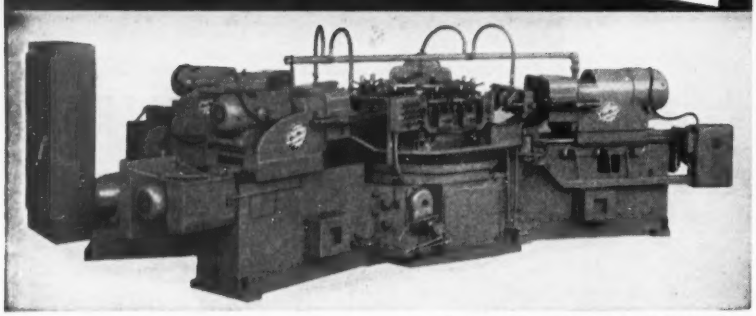
VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

Drilling and Reaming

388 KING PIN HOLES PER HOUR





Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

VALVES, Air

Bellows Co., 230 W. Market St., Akron, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr. Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bellows Co., 250 W. Market, Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hendey Machine Co., Inc., Torrington, Conn.
Homestrand, Inc., Larchmont, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2, Mich.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Rockford Mch. Trol Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VISES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS

General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

(*Continued on page* 440)

(For more information on products advertised, use Inquiry Card page 245)



MAXIPRES forging operations at Titan Metal Manufacturing Co., Bellefonte, Pa.

Typical Titan forgings. Note intricate designs.



3600 TITAN Forgings Per Hour

. . . from this battery of

HIGH SPEED FORGING MAXIPRESSES!

Titan Metal Manufacturing Co., Bellefonte, Pa., specialists in quality brass and bronze forgings, is achieving outstanding production rates with this battery of three National High Speed Forging MAXIPRESSES, which reach 1,200 forgings per press per hour!

Titan forgings, many of intricate shapes with thin wall sections, vary in weight from less than one ounce up to 100 lbs. They are precision forgings, due in part to the over all ruggedness and built-in rigidity of the MAXIPRES.

If you have a forging problem—large or small, hot or cold—ferrous or non-ferrous—let us help you solve it. Send us prints, or a sample part, or, better yet, visit us. No obligation.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

WASHERS, Spring

Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W. Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co. 254 Laurel Ave., Des Plaines, Ill.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

WELDMENTS

Mahon, R. C., Co., Detroit 34, Mich.
Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIRE

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Cleco Div., Reed Roller Bit Co. (Impact, Pneumatic), 5125 Clinton Ave., Houston 20, Tex.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.

WRENCHES, Pipe

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Peck, Stowe & Wilcox Co., Southington, Conn.

WRENCHES, Ratchet

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Keller Tool Co., Grand Haven, Mich.

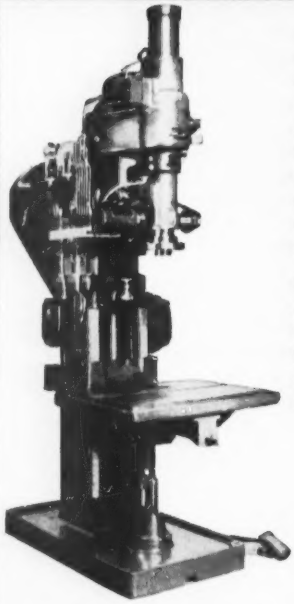
WRENCHES, Tap

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Sturtevant, P. A., Co., Addison, Ill.

KAUFMAN
TAPPING MACHINES
BUILT FOR SPECIFIC PRODUCTION JOBS



Kaufman has specialized for many years in the building of tapping machines. Every machine is precision-built to meet the requirements of individual production jobs. Built with fully automatic cycle, single or multiple spindle heads and other most advanced features.

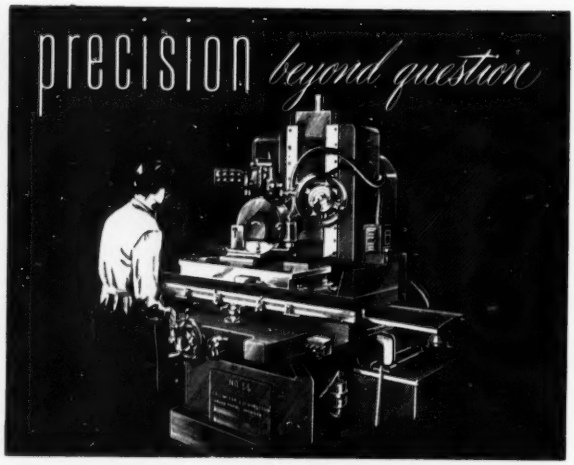
Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

Catalog Number 1153 mailed on request.

KAUFMAN
MANUFACTURING CO.
549 South 29th Street
Manitowoc, Wisconsin

The Model "A"
Kaufman Tapper

precision *beyond question*



The requirements exacted of surface grinding machines leave no room for variation. Precision and tolerance control must be built-in. Through the years Grand Rapids Grinders have demonstrated the highest quality and unquestioned dependability of performance. Upon this record they have been accorded world-wide acceptance. Here is precision beyond question.

GALLMEYER & LIVINGSTON CO.
305 Straight Ave., Grand Rapids, Mich.

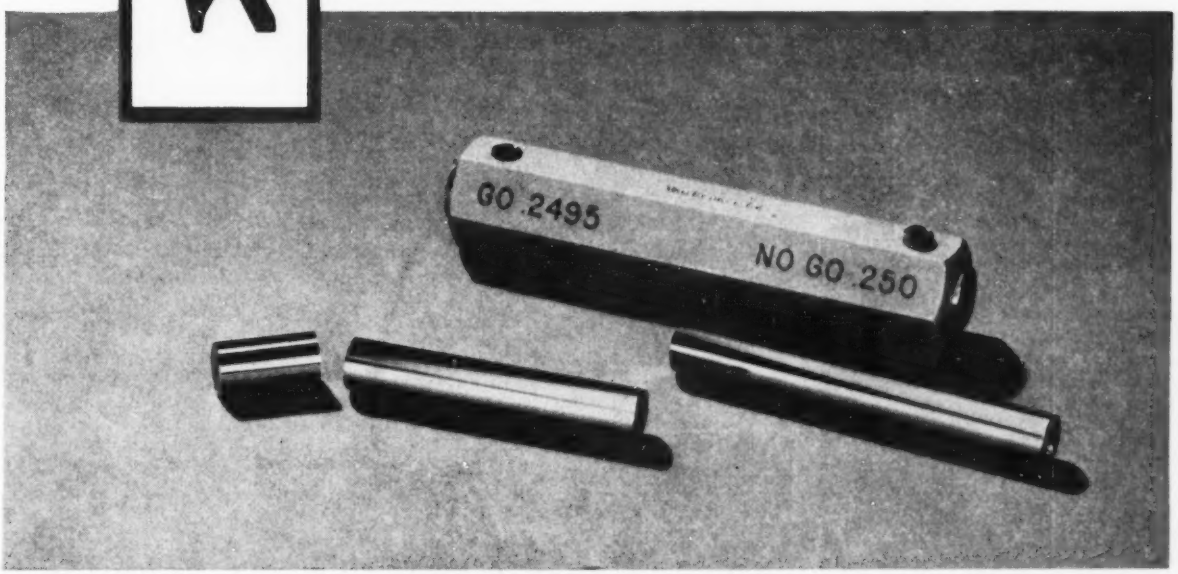
GRAND RAPIDS GRINDERS

MANUFACTURERS OF SURFACE GRINDERS, CUTTER AND TOOL GRINDERS, TAP AND DRILL GRINDERS

GALLMEYER & LIVINGSTON

(For more information on products advertised, use Inquiry Card page 245)

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED and MONEY-SAVERS

because they're "Cut-off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able". And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1 7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog and Handbook No. 35, available on request by writing to: The Van Keuren Co., 178 Waltham Street, Watertown, Mass.

VK

34th YEAR

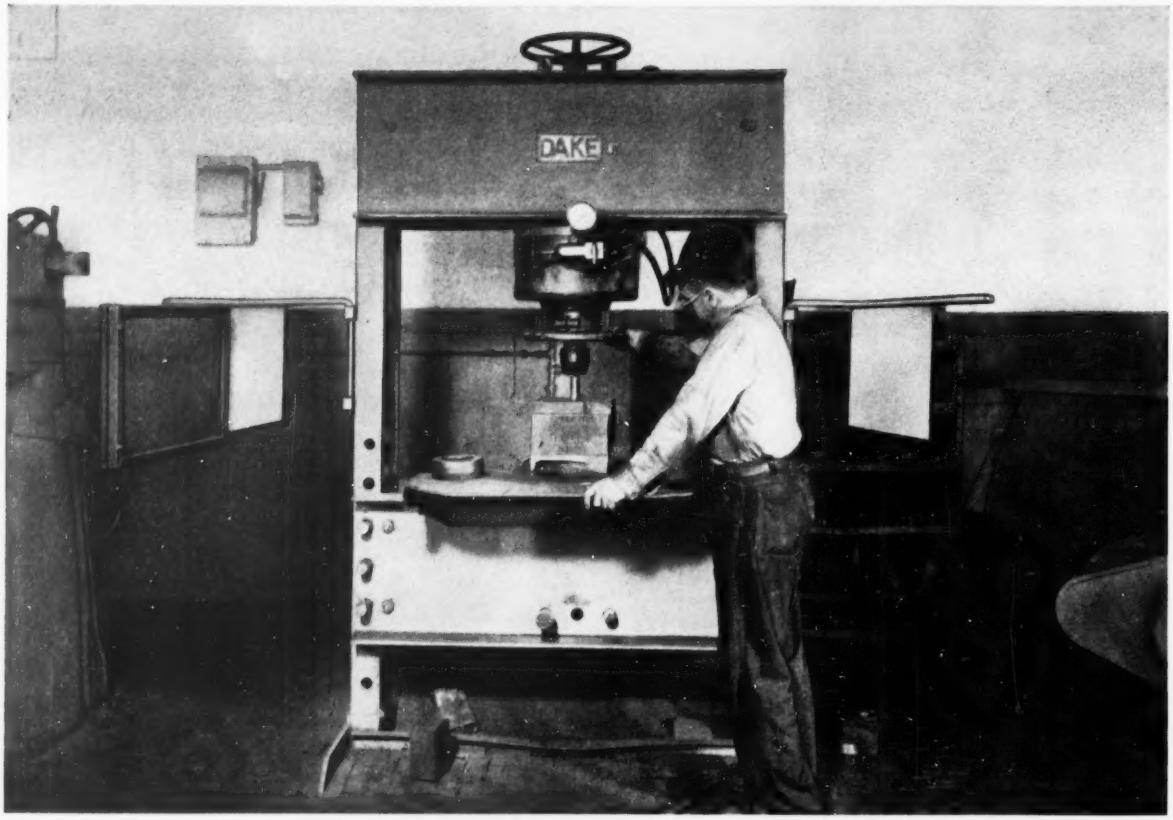
THE *Van Keuren* CO.,

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires Chrome Carbide Taper Insert Plug Gages



(For more information on products advertised, use Inquiry Card page 245)



DAKE PRESS REPLACES THE "HERNIA METHOD" OF KNOCKING OUT DIE INSERTS

The job of knocking out forging die inserts formerly required two men, and sometimes several hours of hand sledging. Now one man does it easily in a few minutes with a Dake 125-ton Air-hydraulic Press.

The die and drive pin are placed under the press ram as shown, and pressure is applied up to the 125-ton capacity. If pressure alone fails to break the insert loose, heat is applied around the die until expansion permits breakaway, which comes with a sudden impact under the sustained high pressure.

Special safety gates — hinged to the side frame of the press — are kept closed during application of pressure and heat as a protection to the operator.

Savings in labor costs have been tremendous, but management reports that even this great benefit has been overshadowed by the improvement in labor relations, and the more intelligent grade of manpower that can be assigned to the work.

Dake Hydraulic Presses have scores of uses in industry. A variety of styles and capacities makes them adaptable to almost any requirement. We suggest that you contact your nearest Dake representative about your pressing problems — or write us and we will ask him to call.

Dake Engine Company, 604 Seventh St., Grand Haven, Mich.

DAKE PRESSES


Arbor Presses


Hand Operated Hydraulic


Power-Operated Hydraulic


Guided Platen


Gap Type Presses


Movable Frame

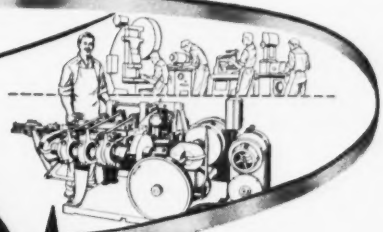
(For more information on products advertised, use Inquiry Card page 245)



Save Metal

Save Labor

Wire and Ribbon Metal



NILSON FOUR-SLIDE

FORMING MACHINES

Starting from a coil of wire or ribbon metal, NILSON FOURSLIDES straighten, feed, pierce, blank, swage, stamp, or coin, cut-off and form up to 300 precision parts per minute—ALL AUTOMATICALLY.

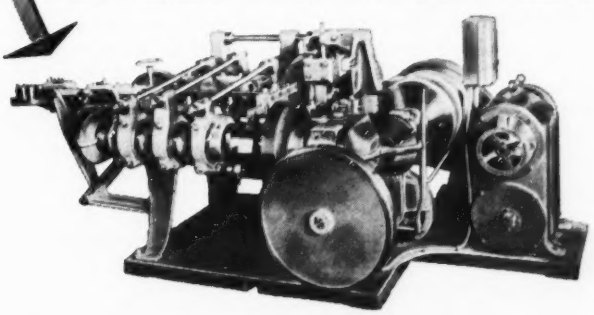
Save Metal—NILSON FOURSLIDES permit stamping and forming to full width of material with minimum scrap and spoilage.

Save Labor—By combining press and forming operations, secondary handlings are eliminated. Greater production at lower unit cost.

THERE'S NOTHING LIKE A **NILSON**

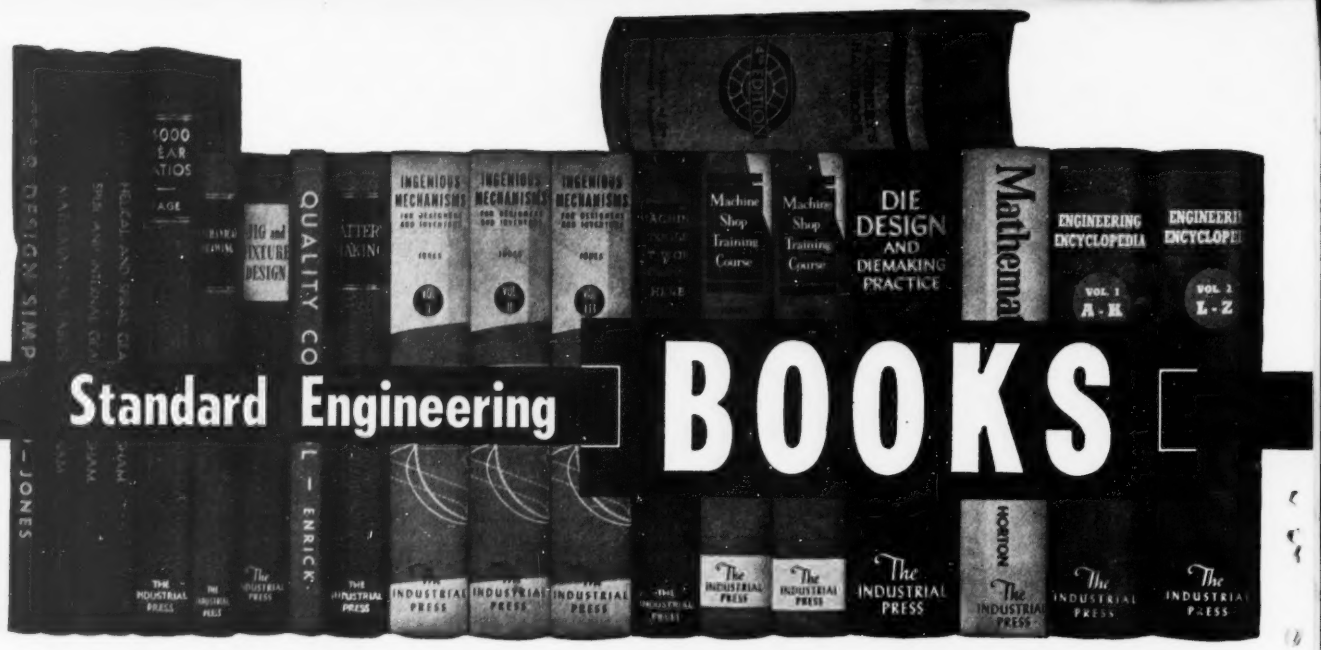
Send us a sample or print of your product or parts for specific recommendations.

THE A. H. NILSON MACHINE COMPANY
1518 Railroad Avenue • Bridgeport 5, Connecticut
CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • HAMILTON, ONT., CANADA



NILSON has been specializing in Forming Equipment for over 50 years.

Range of Sizes:
Wire Forming: 1/32" thru 1/2".
Ribbon Metal: 1/32" thru 3 1/2" wide.
Press section capacities: 5 to 30 tons
50 to 75 tons in heavy duty types.



MACHINERY'S HANDBOOK — 14th Edition

Since its first edition, almost a million copies of this invaluable reference book have been sold. The 14th edition of this world-renowned book contains the latest and most useful machine-designing and machine-shop data available—the kind of information that is needed by everyone who designs or builds machines, tools or mechanical devices. Changes in standards and practices often make old handbooks unsafe to use. Be sure you have the latest information on new or revised standards, as well as complete mechanical and mathematical tables, rules, formulas, and general data—all contained in one handy volume. 1911 Pages. $8.00 postpaid in U. S. Canadian or foreign postage, 75¢.

DIE DESIGN AND DIEMAKING PRACTICE

Presents in clear, concise fashion, drawings of a tremendous variety of dies, and a vast amount of data representing the combined experience of the best die-makers and die designers in the U. S. In the new 3rd Edition, 141 pages of new material have been added, covering the latest developments. This book has long been a standard reference work, and has been used by some 40,000 diemakers, designers and tool engineers. 1083 Pages. 661 Illustrations. $7.00 post-paid in U. S. Canadian or foreign postage, $1.00.

MATHEMATICS AT WORK

A convenient, comprehensive, problem-solving guide written expressly to show how arithmetic, algebra, geometry, trigonometry and logarithms are applied to problems in the metalworking field. Contains a 100-page review of the fundamentals of each branch of mathematics; 482 pages of illustrated mechanical problems, with step-by-step analyses and solutions; 146 pages of standard mathematical tables needed for all types of problem solving. 728 Pages. 196 Illustrations. $7.00 postpaid in U. S. Canadian or foreign postage, 80¢.

MACHINE TOOLS AT WORK

An outstanding selection of machine shop operations illustrating the applications of modern machine tools. The 434 close-up photographs make it a veritable sightseeing tour through the outstanding machine shops of the United States. 584 Pages. $6.00 postpaid in U. S. Canadian or foreign postage, 80¢.

INGENIOUS MECHANISMS FOR DESIGNERS AND INVENTORS

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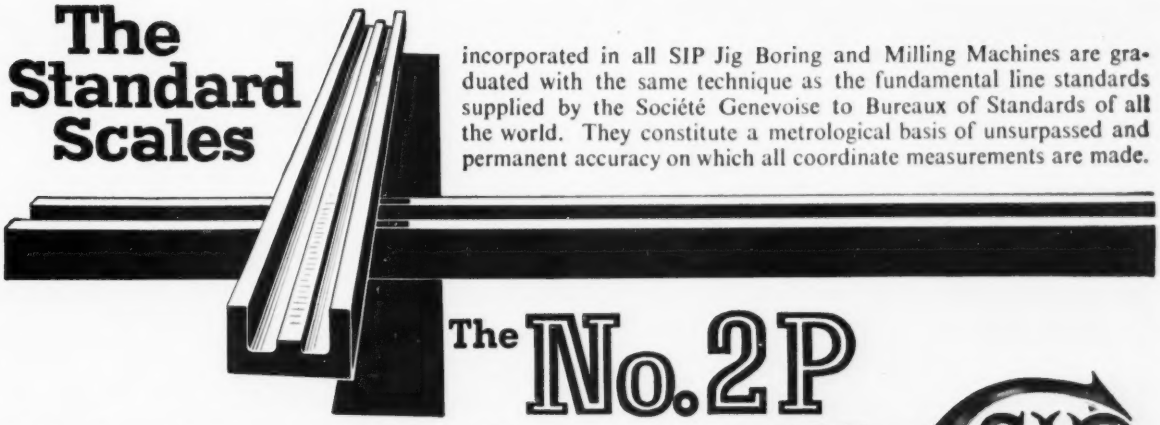
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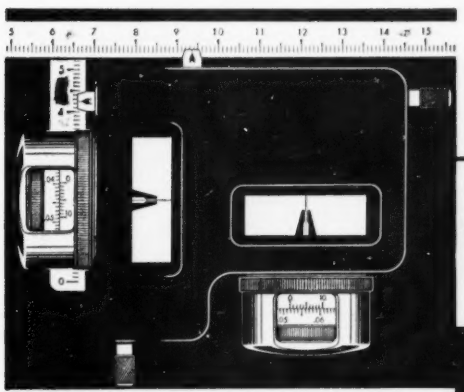
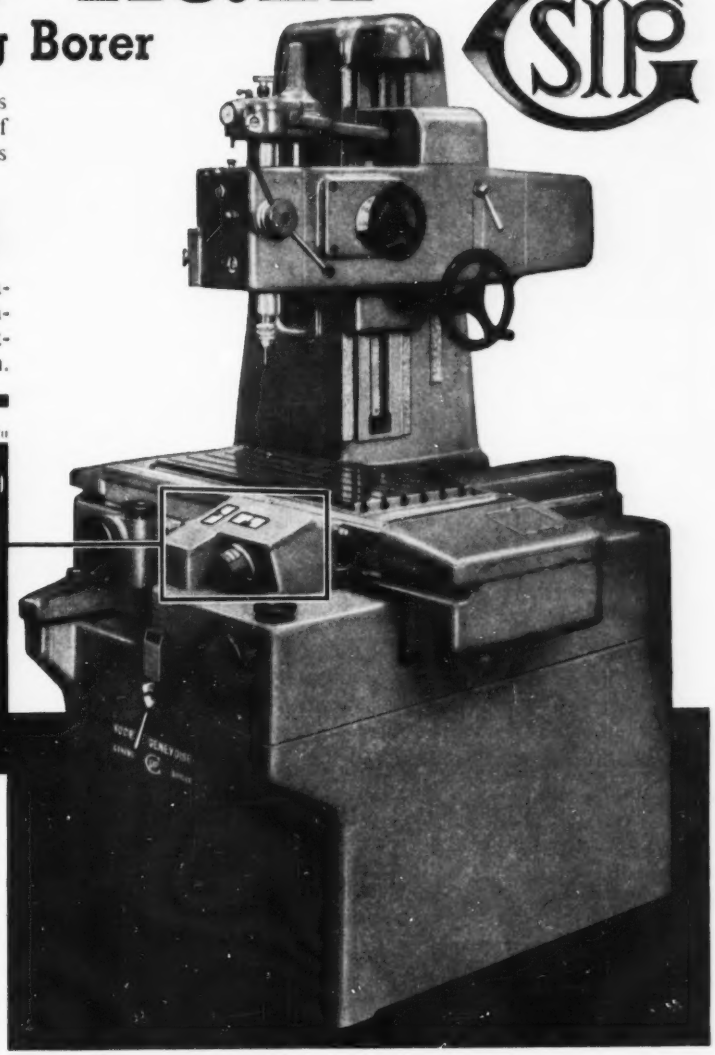


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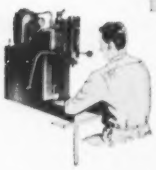
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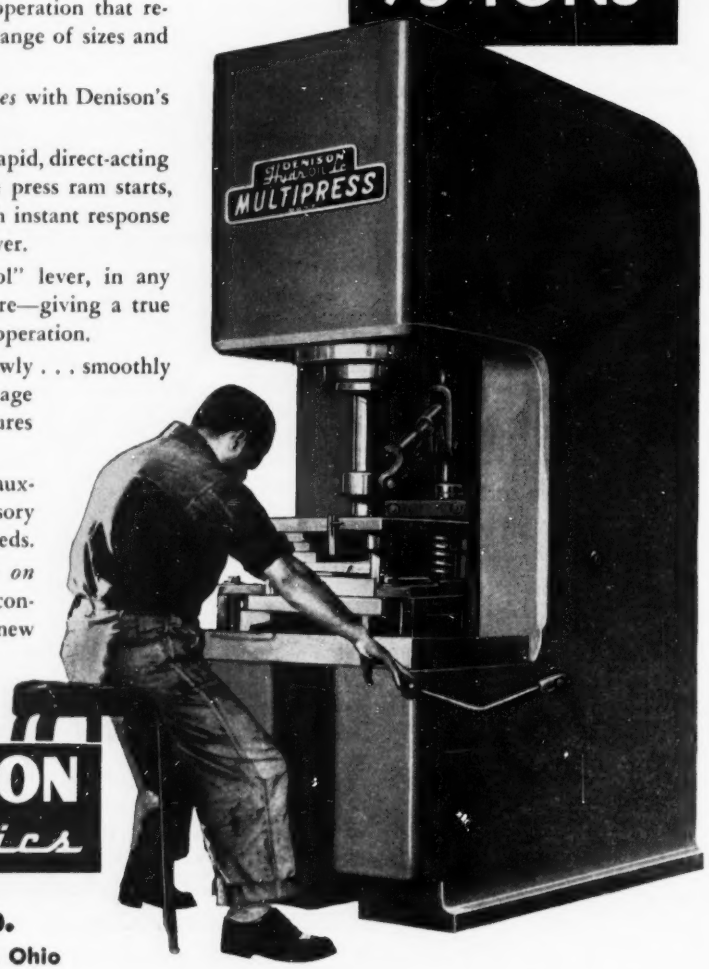
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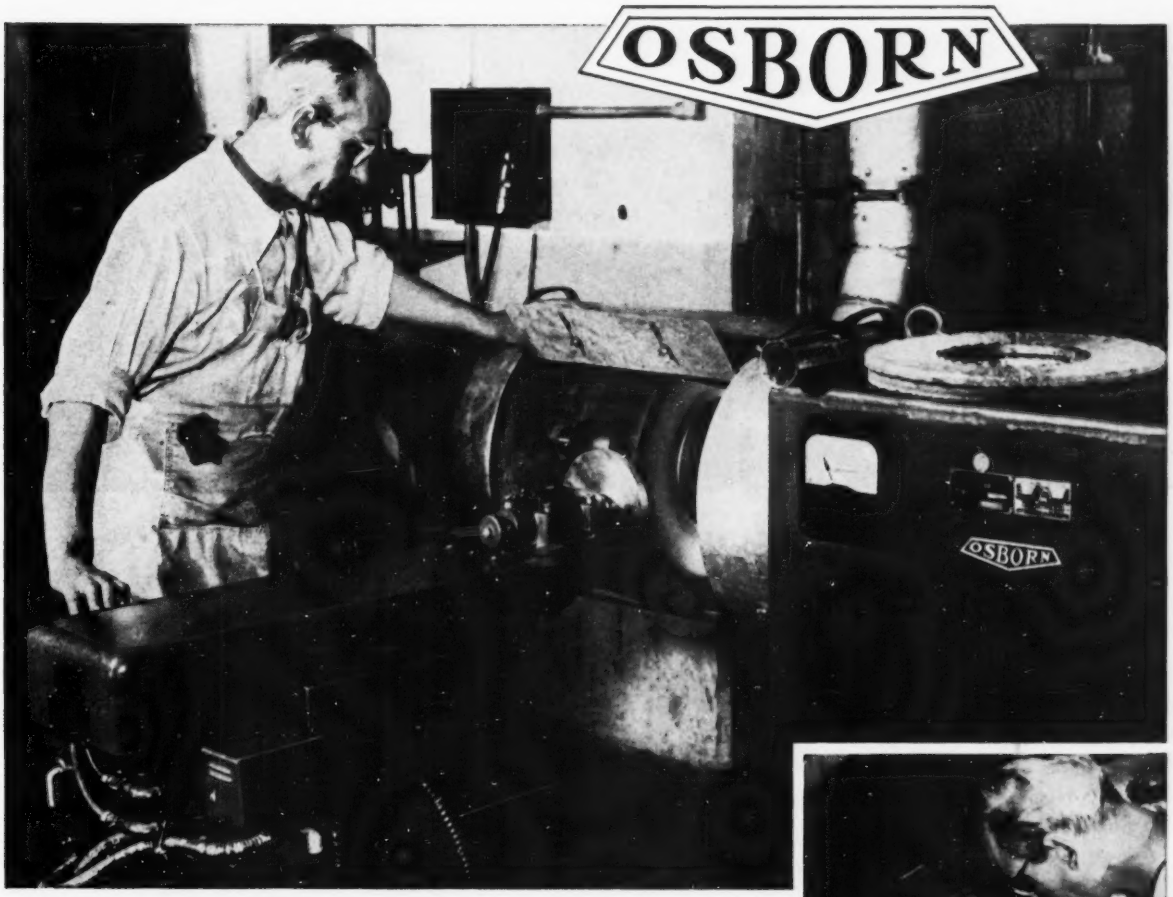
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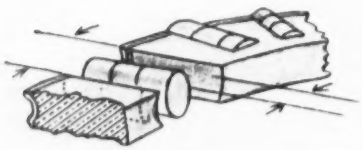
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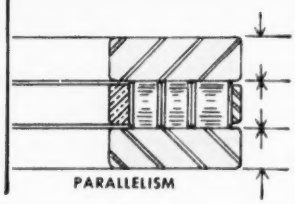
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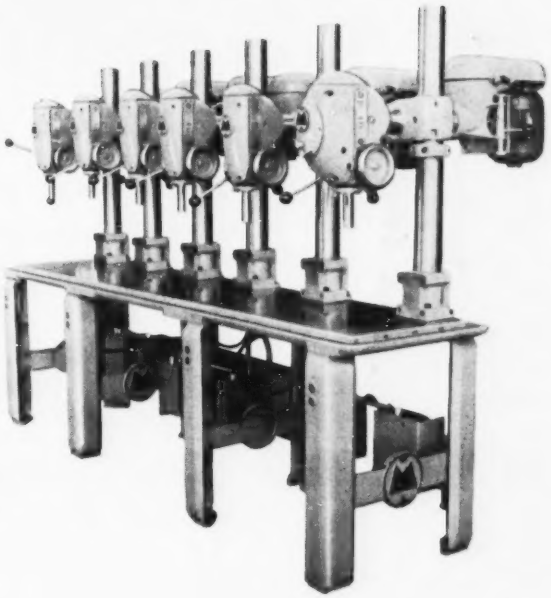
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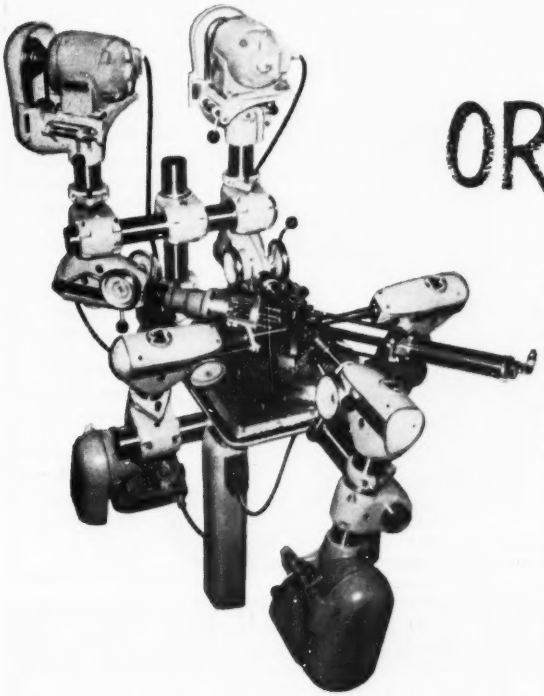
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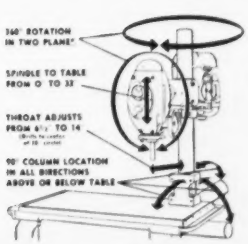
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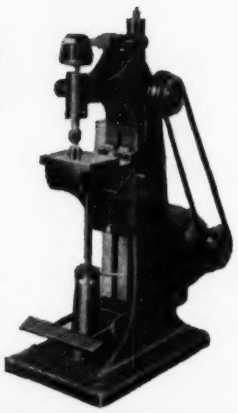
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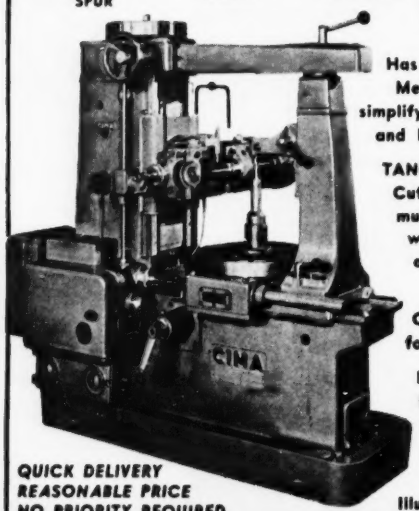
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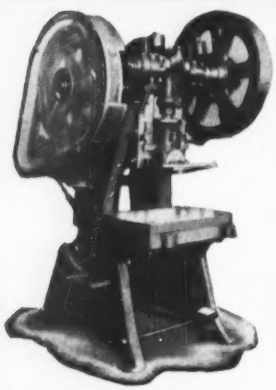
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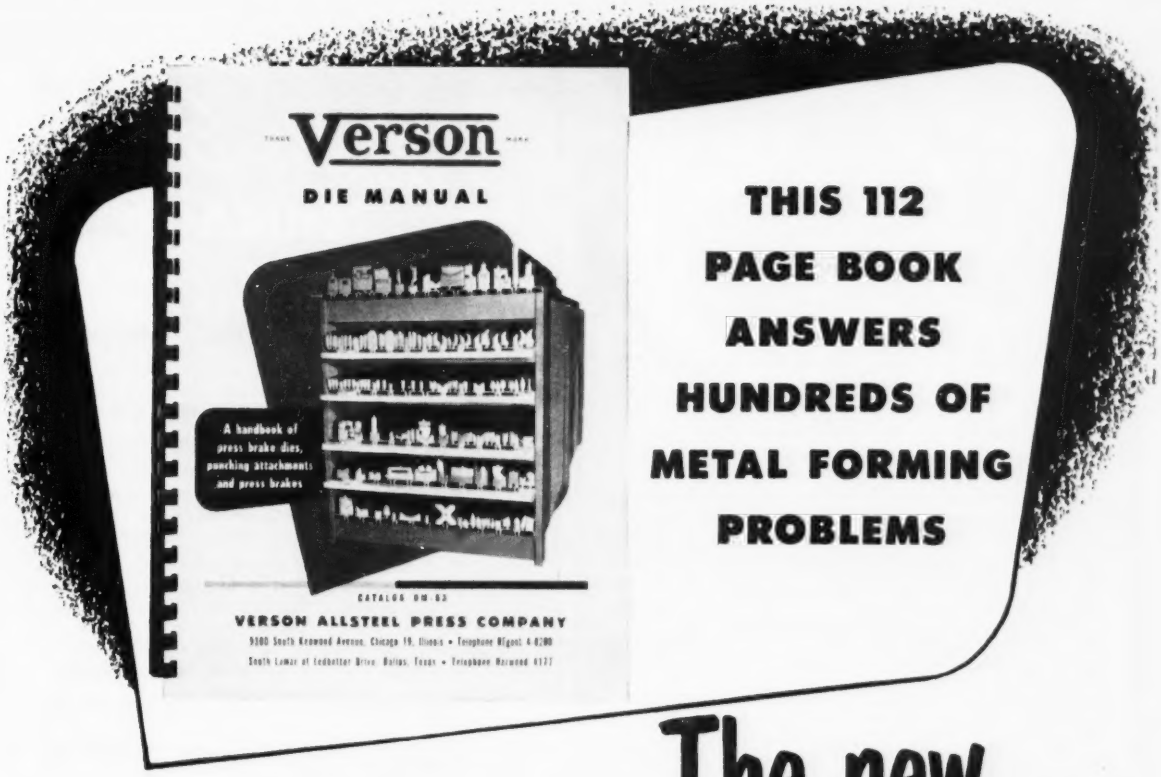
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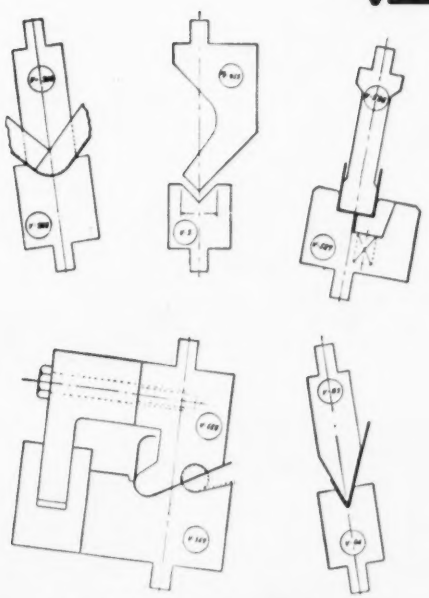


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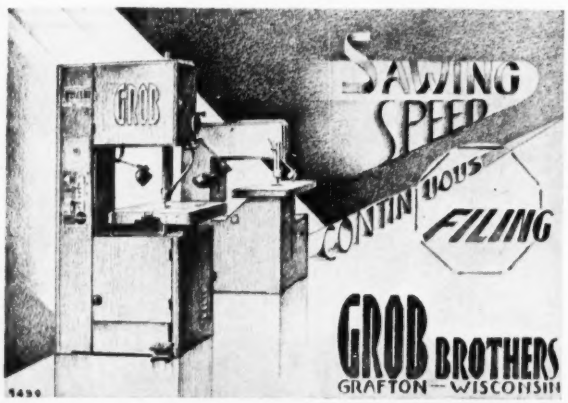
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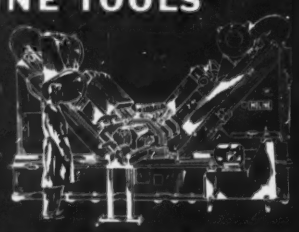


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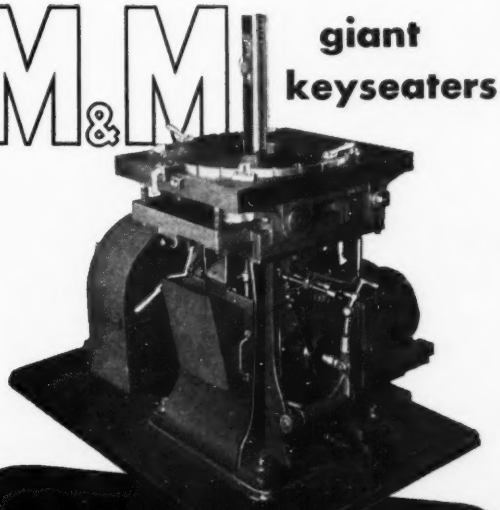
Cam Specialists — plus specially designed equipment! That's the reason why Rowbottom is known as cam-making—and cost-cutting headquarters. Whenever you need cams, in any size, type, or quantity, you can be sure that Rowbottom-made cams, will be right in design and in price

THE ROWBOTTOM MACHINE CO.

WATERBURY, CONN, U. S. A.

Rowbottom for Cams

M&M giant keyseaters



M & M Giant Keyseaters, built in a range of sizes, speedily and accurately cut interval keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems.

MITTS & MERRILL

64 Holden Street • SAGINAW, MICHIGAN

62

SMALL PART

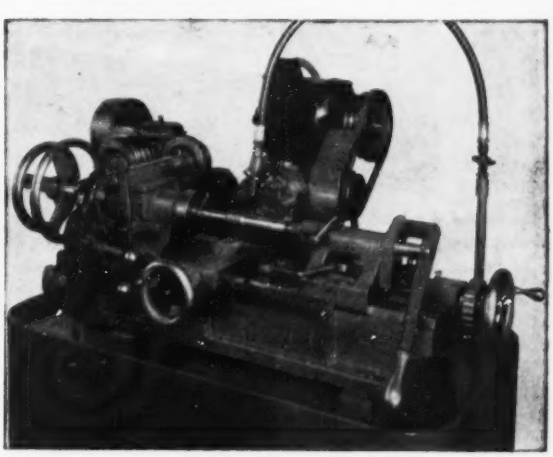
THREAD MILLING ...AT A PROFIT!

WHEN you want smooth, accurate threads, economically cut at high production speeds—use the Waltham Thread Miller. Automatic, except for loading and unloading, it permits one operator to handle several machines. Low in first cost, low in tooling cost, low in operating cost, the Waltham Thread Miller can be used profitably to thread with precision a great variety of work. Send drawings or samples of threaded parts, and let us send you bulletins describing this and other Waltham machines.

WALTHAM MACHINE WORKS

Newton Street

WALTHAM, MASS.

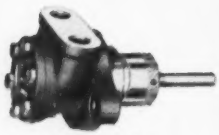


The VIKING LINES are COMPLETE!

for:

LUBRICATING PUMPS

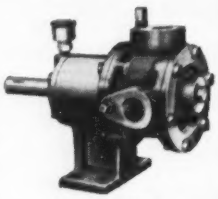
Pumps built for bearing lubrication service up to 500 psi handling lubricating oils. Ask for free bulletin 1803J.



½ To 3½ G.P.M.

COOLANT PUMPS

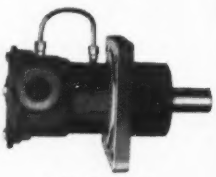
Viking coolant pumps feature the relief rotor . . . no bypass needed. Handy port location. Just turn casing in bracket to fit your piping. Ask for free bulletin 1100J.



5 To 35 G.P.M.

HYDRAULIC PUMPS

Suitable for pressures up to 500 psi on hydraulic oils, intermittent service. 250 psi on continuous service. *Ask for free bulletin 303J.*



5 To 200 G.P.M.

VIKING
AN HONORED NAME IN PUMPING

See Our Catalog In SWEETS

Viking PUMP COMPANY
Cedar Falls, Iowa

WHEN YOU NEED COOLANT



YOU NEED A RUTHMAN **GUSHER** COOLANT PUMP

This Special Chamfering Machine manufactured by the Cleveland Tapping Machine Company is equipped with a Gusher Coolant Pump.



On any cutting operation that demands the use of a coolant, a Gusher Coolant Pump offers you efficiency, dependability, and long trouble-free life. You get split second flow of coolant from the moment the machine is turned on. There is no packing or priming necessary. The simple construction, electronically balanced rotating shaft and heavy-duty pre-lubricated ball bearings of Gusher Coolant Pumps assure you dependable service. Write us today, we'll be glad to send you full information on types and models of Gusher Coolant Pumps.

THE RUTHMAN MACHINERY CO.
1807 Reading Road — Cincinnati 2, Ohio

WILLEY'S TUNGSTEN CARBIDE TOOLS

CARBIDE TIPPED . . . Work Support Blades for CENTERLESS GRINDERS



Standard thrufeed and infeed work support blades available from stock. Prices on special blades quoted on receipt of prints. Worn blades salvaged—retipped and reground.
SPECIAL TOOLS
Send prints for prompt quotes on special tools.

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
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WHO*



makes the finest in
CAP SCREWS • SET SCREWS • MILLED STUDS and COUPLING BOLTS

*Wm. H. Ottemiller Co.
YORK, PENNA.



IMPROVE FACING OPERATIONS
ON BORING MILLS - DRILLS - LATHES MILLERS AND RADIALS

M-D facing Head feeds automatically. Lathe tool bit travels radially from center outward or reverse. 10 sizes, 6" to 46" dia. Write for bulletin, prices.

MUMMERT-DIXON CO. 126 Philadelphia St. HANOVER, PA.

IMPORTANT NOTICE

The Genuine MAUSER **VERNIER CALIPER**
IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT
AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
- SPECIALLY LONG VERNIER to read thousandths
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back



$14.75 PPD

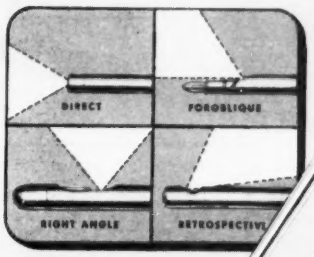
Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Stands.

GEORGE SCHERR CO., Inc.
200-MA Lafayette St. New York 12, N. Y.

(For more information on products advertised, use Inquiry Card page 245)

A.C.M.I. BORESCOPES

for close-up visual inspection of internal surfaces and hidden parts



A.C.M.I. Borescopes are available in 4 angles of vision (as above)—in diameters of .120" to 4.00"—in lengths of 4" to 720". Special models for special problems.

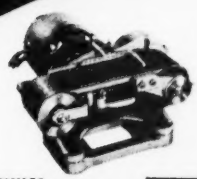
A.C.M.I. Borescopes permit close-up visual examination of interior areas and surfaces not otherwise visible. They save time and money, and prevent costly dismantling. • Each Borescope is a compact, self-illuminated industrial telescope of highest quality, employing a precision optical system, that produces a flat visual field. Lens systems are fully corrected for color, spherical aberrations, and coma, with all lens surfaces coated to increase light transmission

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American Cystoscope Makers, Inc.
1241 LAFAYETTE AVENUE NEW YORK 59, N. Y.

DOES IT BETTER... DOES IT FASTER

SIMPLEX-M
ABRASIVE BAND GRINDER

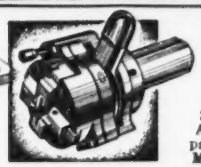


The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

See our Advt on page 417 May 1953

THE EASTERN MACHINE SCREW CORP., 25-43 Barclay St., New Haven, Conn. Pacific Coast Representative: A. C. Behringer, 334 N. San Pedro St., Los Angeles, Calif. CANADA: F. F. Barber Machinery Company, Toronto

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CALL WILLIAMSON FOR **GEAR**

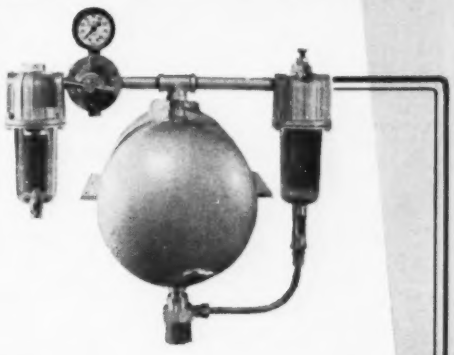
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HOBBING . . . . SHAPING
LAPPING . . . . SHAVING
GENERATING—ALL TYPES

WILLIAMSON GEAR & MACHINE CO.
2606 MARTHA STREET PHILADELPHIA 25, PA.

HERE'S A COOL SOLUTION TO A HOT PROBLEM!

LO-JET ACRO



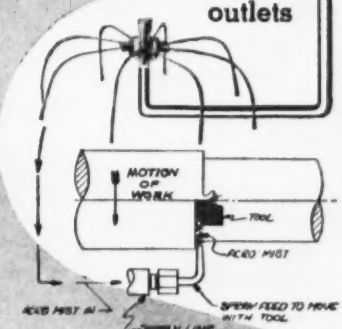
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KEEPS CUTTING TOOLS AND WORK AT ROOM TEMPERATURES!

*Proven results at leading automotive manufacturers.***

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USED FOR ALL MACHINING OPERATIONS
PROLONGS TOOL LIFE
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IT'S CLEAN, TOO!



One unit can service up to 8 operations

*Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

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Our engineering staff will cooperate FREE of charge. Send blue-prints for estimate.

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gentlemen: Please send me FREE literature and details of the new acro low jet. M

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ALWAYS IN HIGH GEAR—

For the production of precision built gears to meet your specifications. Diefendorf meets the demands of industry for gears of all sizes, metal and non-metallic, for specially designed equipment or for contract manufacture.

DIEFENDORF GEAR CORPORATION

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Gears for special applications, such as the double-cable flange spur gears illustrated, are routine at Stahl Gear. Years of specialized experience—skilled workmen—precision equipment—all result in gears that are made right, fit right, last longer. If it's gears you want, accurate gears that are produced economically and on time, get a Stahl estimate first.

SPURS TO 72" PD, 1 DP

BEVELS TO 54" PD, 1 DP

SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP

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RACKS TO 20 FT. LONG, 3 DP

SILENT GEARS; RAWHIDE, BAKELITE, FABROIL

HEAT-TREATED, CASE OR FLAME HARDENED GEARS—OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY

3901 Hamilton Ave. Cleveland 14, Ohio

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THRIFTMASTER *Universal Joint Type* **DRILL HEADS**

have these exclusive* features

6 Standard Models

Models U-608 and U-1000—Ball Bearing

Models U-620B and U-1012B — Plain Bearing, 11/16" or 1/2" min. centers.

Models U-608-BS and U-1000-BS — Ball Bearing Gear Case, Plain Spindles

Semi-Standard Heavy Duty Full Ball Bearing

1/2" in Cast Iron — 1 7/6" min. centers 7 1/8" or 9 3/4" Dia.

1/2" in steel—1 13/16" min. centers 7" or 9 5/8" Dia.

Also Larger Adaptations and Full Line of Fixed Center Drill Heads.

* Standard Full Ball Bearing Construction, including Spindles

Driving assembly in FULL BALL BEARING mounted with 3 Bearings on each spindle. Thrust load carried by radial thrust bearings.





* Standard Slip-On and Slip-Off Template Construction

For accurate setting and locating spindle brackets are machined to receive slip-on and slip-off template.

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Subsidiary of Thomson Industries, Inc.

THRIFTMASTER *Products Corporation*

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Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS

MORGAN CRANES

LIFT AND CARRY WITH

When you speed up parts and materials handling you lower costs! Morgan Cranes can handle every transportation assignment in your shop—safely, economically and efficiently. Call on Morgan when you have a lifting or carrying problem.

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GEARS — ALL MAKES . . . Special and Standard

PRECISION GEARS UP TO 200 DIAMETRAL PITCH

All Gears certified for Accuracy
Quality and Fine Workmanship

NEW JERSEY GEAR & MFG. CO.

1470 Chestnut Ave. Hillside, N. J.

JIG AND FIXTURE DESIGN

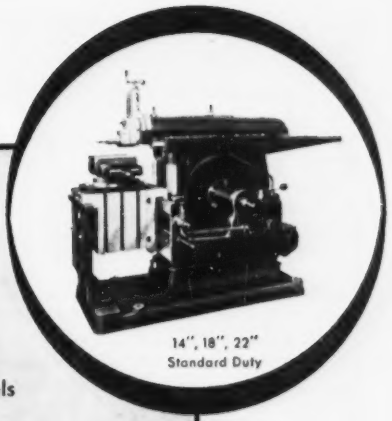
A practical book with 382 pages of information on the design and construction of jigs and fixtures for drilling, boring, planing and milling. $4 per copy. Sent on approval.

MACHINERY, 148 Lafayette St., New York 13, N. Y.

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VMA ... the finest in shapers!

Superb Swedish craftsmanship, plus fine design and construction backed by 50 years' experience, makes the VMA line of shapers outstanding production and tool room machines. Three sizes, in both the standard and heavy-duty models, cover a wide range of machining requirements. Simplified controls are grouped conveniently for the operator. Both standard duty and heavy duty models provide a generous selection of speeds and feeds. Table power rapid traverse is standard on heavy duty models. A rugged, swivel-base vise, motor and starter are standard equipment. You will be pleased with the modest prices and early delivery dates.



14", 18", 22" Standard Duty



18", 22", 26" Heavy Duty

Prompt delivery — Attractive Price — Write for Folder!

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Dealers in principal cities

Look for the Austin Seal — your full guarantee of satisfaction!



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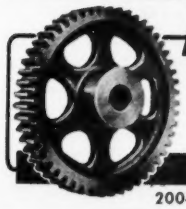
Brinell—Shore—Scale

Included in our improved Portable Scleroscope Model D-1. This efficient single scale tester registers Brinell-Shore values without damage to the work. The old standby for forty-three years.

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ATLANTIC GEARS

- SPUR — SPIRAL — WORM
- BEVEL GEARS GENERATED WITH PRECISION ON MODERN EQUIPMENT.
- Send SAMPLE or BLUEPRINT for QUOTATION

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ATLANTIC GEAR WORKS Inc.

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PATENTED CUTTING OFF TOOL HOLDERS
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Manufactured by

J. MILTON LUERS, 12 Pine Street, Mt. Clemens, Mich.

Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
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- All Capacities

in inch ounces
...inch pounds
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(All sizes from 0-6000 ft. lbs.)



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GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
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No. 13LS Fellows Gear Lapper, m.d.
8G11 Gear Grinding Machine, m.d., latest
6G19 Gear Grinding Machine Co., m.d., latest

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No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. 12 Barber-Colman Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d., Spur & Spiral
Pfauter Gear Hobber, Model RS 1, m.d., new
No. 3 Newark Gear Hobber, Plain Type, m.d.
Model 3 Gleason Gear Generator, m.d.

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Gleason Spiral Bevel Gear Rougher, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.

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12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
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AUTOMOTIVE GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m.d., late
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 5/8" valve stems, m.d.

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Model 120A Gardner, double spindle, m.d.
No. 2 Gardner, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
No. 124—53" Gardner, m.d., vee belt
14A Gardner Grinder, m.d.

PLAIN CYLINDRICAL GRINDERS

6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x30" Cincinnati Hydraulic, m.d.
10x18" Cincinnati Model EA, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16" raised to 26"x72" Type C Norton, m.d.
No. 20—10x18" Brown & Sharpe, m.d.
20x120" Landis Plain Self-Contained, m.d.

EMERY GRINDERS

3 H.P. Baldor Pedestal Type
5 H.P. U.S. Elec. Tool Co., latest
#516 Mummert & Dixon Radial Emery Grinder, m.d., 5 H.P. motor

UNIVERSAL CYLINDRICAL GRINDERS

No. 3 Brown & Sharpe Universal Grinder, m.d.
6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
16x24" Cincinnati Self-Contained, m.d.
12x48" Norton Universal, m.d., latest

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No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Airplane Cylinder Grinders, brand new, m.d.
Model FG Micro Cylinder Grinder, m.d.

SURFACE GRINDERS

No. 2B Brown & Sharpe, m.d.
No. 2 Brown & Sharpe, m.d.
Arter Model A-1-8" Rotary, m.d., latest
No. 121 Hanchett Production Face Grinder, type BD, m.d.
No. 22—12" Heald Rotary, m.d.
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
Model DA—12" O.S. Walker, m.d., latest
Delta Toolmaker Surface Grinder, m.d.

We carry an average stock of 2,000 machines. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
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MODERNIZE for ECONOMY — with MOREY

1000 LATE TYPE TOOLS IN STOCK

AUTOMATIC SCREW MACHINES

ACME GRIDLEY 9/16" cap. Model RA. 6 spindle; late
ACME GRIDLEY 1⅝" cap., Model R-6 spindle, late
CLEVELAND 3¾" model "A" single spindle; late
CLEVELAND 5¾" Model "A"; M.D., late
CLEVELAND 8" model "A" M.D., late
CONE 4⅜" 4-spindle, M.D., late
GYROMATIC "Tavannes" #40 6-spindle; late

BORING MILLS—Vertical

BULLARD 24" spiral drive; M.D., late type
COLBURN 72" 2-swivel heads, rapid traverse, M.D.
NILES 53" 2-swivel heads, P.R.T., M.D.
NILES 100" 2-swivel heads, P.R.T., M.D.

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BESCO 60" 16-gauge Press Brake; NEW
BESCO 36" 20-gauge Power Squaring Shear; NEW
BESCO 48" 14-gauge Power Squaring Shear; NEW
BESCO 72" 14-gauge Power Squaring Shear; NEW
CHAMBERSBURG 500 HP Billet Breaker; late type
NIAGARA No. 160 60" x 18-gauge; late type
QUICKWORK No. 5 Rotary Shear, 5/8" cap. M.D.
QUICKWORK No. 6 Rotary Shear, 1" cap. M.D.
WORMSER T-15; T-25; T-30 Ironworker; NEW

BROACHES

CINCINNATI 1-30 Duplex Vertical, Hydraulic; late
COLONIAL VG-1-10-48 Vertical, Hydraulic; late
OILGEAR 3XA Horizontal, Hydraulic; late

DRILLS, Miscellaneous

ALLEN No. 3, 4-spindle, 4 motor dr., No. 4 M.T., late
AMERICAN 4' arm 11" col. "Hole Wizard" with BULLARD 30"x20" Man-au-trol Spacer table; latest
BARNES No. 420 Deep hole; late
BARNES #2 Hydram, cap. 2", No. 5 M.T., hyd., late
BARNES 20", 4-spindle Camel Back, No. 4 M.T., power feed, late type
CINCINNATI 21" round column, M.D. late
LELAND & GIFFORD No. 1 LMS; late
MOLINE 6-spindle Mult. Hole-Hog; 3¼" dia. M.D.
NATCO No. 14 Mult. Rect. Head; PRT; M.D.

MILLING MACHINES—Plain

CINCINNATI 1-18 Automatic; Timken; late type.
KEARNEY & TRECKER Mod. 2HL, M.D., late.
KEARNEY & TRECKER 4H Plain, Timken, late.
ROCKFORD #3 Rigid Mill, motor drive.
STARR #2 table 13"x55", late type

MILLING MACHINES—Thread

HALL Style D Planetary; late.
LEES BRADNER model HT, 12"x36" centers, late.
MOREY 12"x30" centers, late type.

MILLING MACHINES—Universal

CINCINNATI #3 dial type, Timken, M.D. late.
RICHMOND #2 light type, late.

MILLING MACHINES—Vertical

CINCINNATI O-8 vertical; Timken; late type.
KEARNEY & TRECKER 3H Vert., Timken, late.
KEARNEY & TRECKER 3K, H.S., Timken; late.

PLANERS

BETTS (Cons.) 103"x84"x44'; 4 hds; PRT; box table; M.D.
DETRICK & HARVEY 48"x48"x16', 4 hds hydr. M.D.
GRAY 24"x24"x6"; motor drive.
GRAY 36"x36"x10' "Maximum Service."
LIBERTY 144"x76"x48' adj. variable openside, box table, 4 hds, PRT, M.D. Late type.
NILES 48"x48"x10' double 4 hds; PRT, M.D.
NILES 48"x48"x12' "Time Saver", 3 hds, late.
NILES 108"x84"x42' 4 hds, PRT box table, DC, M.D.
N.B.P. 72"x72"x30'; 4 hds; PRT, M.D.

PRESSES

BESCO #18, 10-ton cap.; OBI; NEW
BESCO #EB2, 18½-ton cap., back flywheel; NEW
BESCO #EB4, 40-ton cap., back flywheel; NEW
BESCO #21, 40-ton capacity; OBI; NEW
BIRDSBORO 320 ton, 31x31" bet. uprights; hydr.
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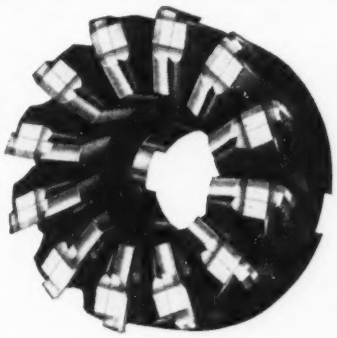
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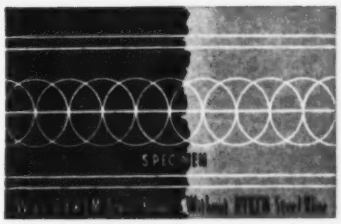


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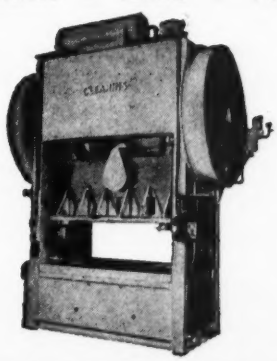
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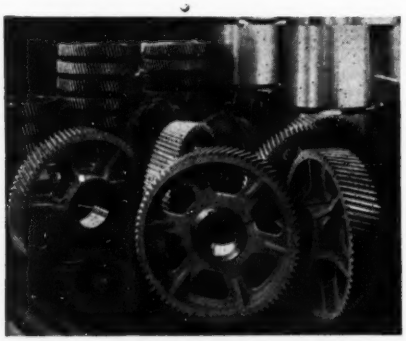
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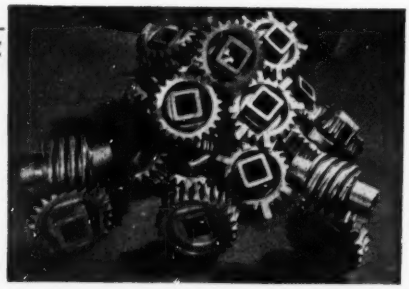
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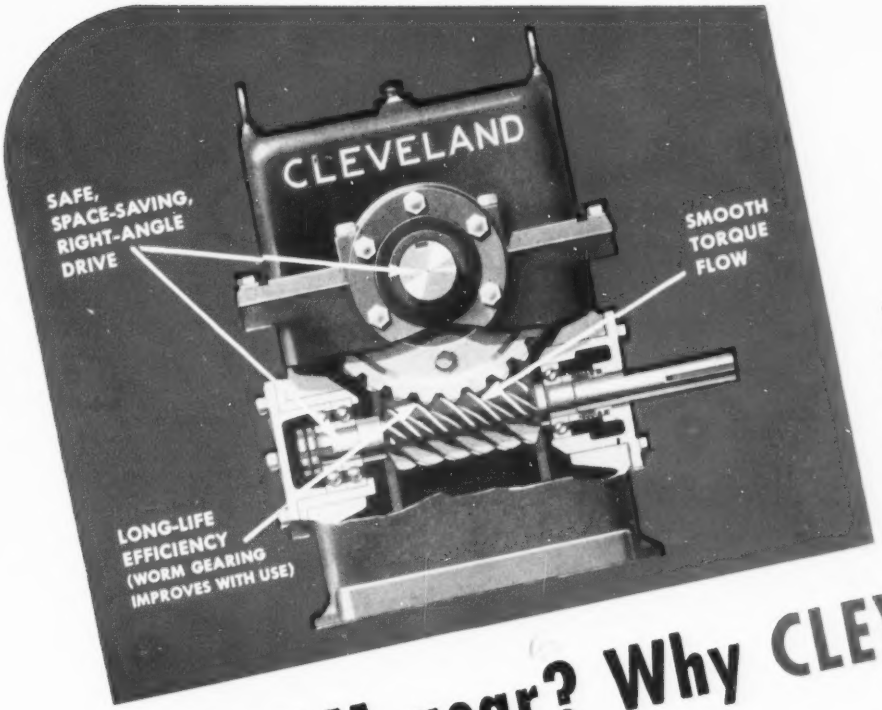
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(For more information on products advertised, use Inquiry Card page 245)



Cutaway shows compact interior design and construction of a typical Cleveland worm gear speed reducer, used in thousands of plants. Clevelands save floor space—are simple to install and maintain. A minimum number of moving parts practically eliminates trouble.

Why WORM gear? Why CLEVELAND?

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Worm Gear
Speed Reducers

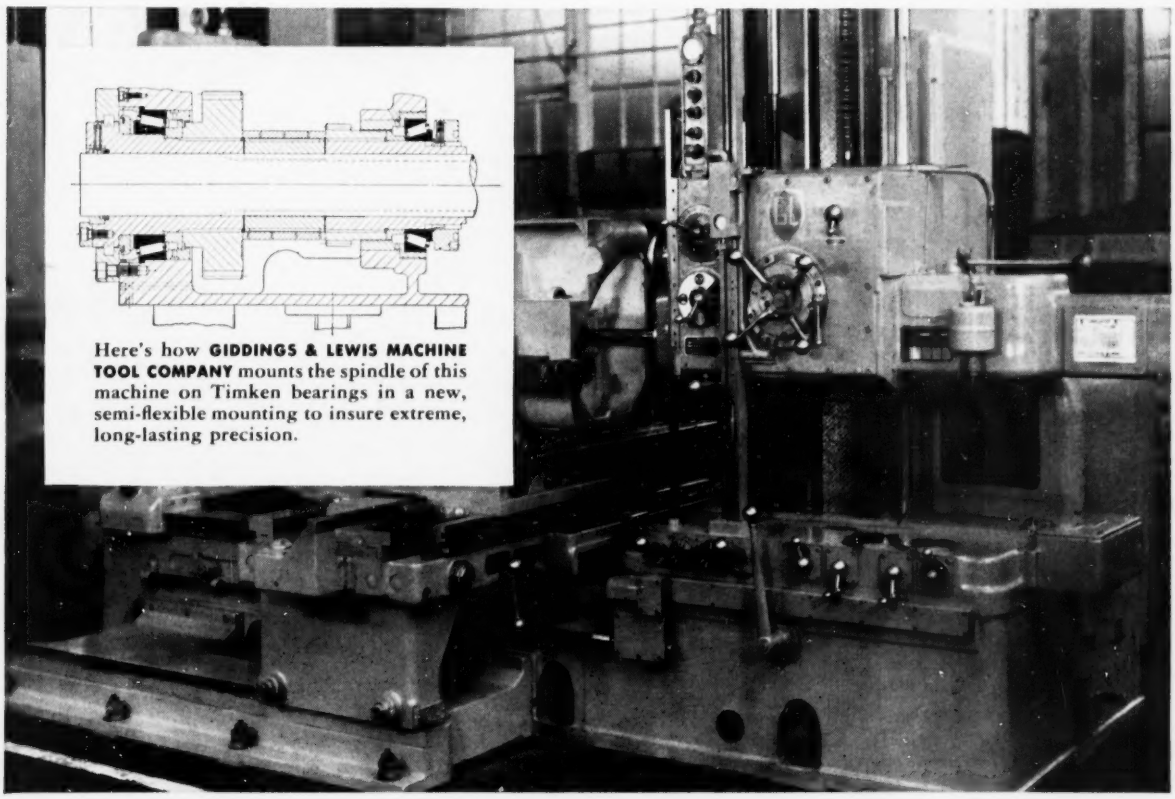
Gets high-speed spindle accuracy with TIMKEN® bearings in new semi-flexible mounting

TO insure high-speed spindle accuracy under varying conditions of speed, temperature and loading, Giddings and Lewis mounts the spindle of its 300 horizontal boring, drilling and milling machine on Timken® precision bearings in a new semi-flexible mounting.

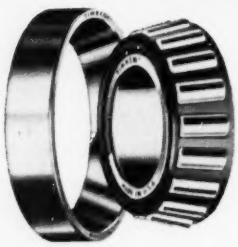
The new semi-flexible mounting was developed by engineers of The Timken Roller Bearing Company specifically to meet the requirements of higher spindle speeds. In this new mounting, the rear spindle bearing is mounted in a carrier, one end of which has a slight clearance in the housing while the other end has a tight fit (see diagram). The clearance between carrier and housing permits radial expansion to take place without excessive preloading of the bearings. The result is uniformly high spindle precision from the beginning to the end of every job.

The new semi-flexible mounting has been thoroughly proved in tests and in machine tools now in operation. For full information, write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED — *This symbol on a product means its bearings are the best.*



Here's how **GIDDINGS & LEWIS MACHINE TOOL COMPANY** mounts the spindle of this machine on Timken bearings in a new, semi-flexible mounting to insure extreme, long-lasting precision.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

MAGNIFYING GLASS INSPECTION OF EVERY ROLLER!



Every one of the over one billion Timken bearing rollers produced every year is inspected with powerful magnifying glasses to detect surface flaws. It's just one example of how the Timken Company insures uniform high quality.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬭ AND THRUST →⬭← LOADS OR ANY COMBINATION ✳